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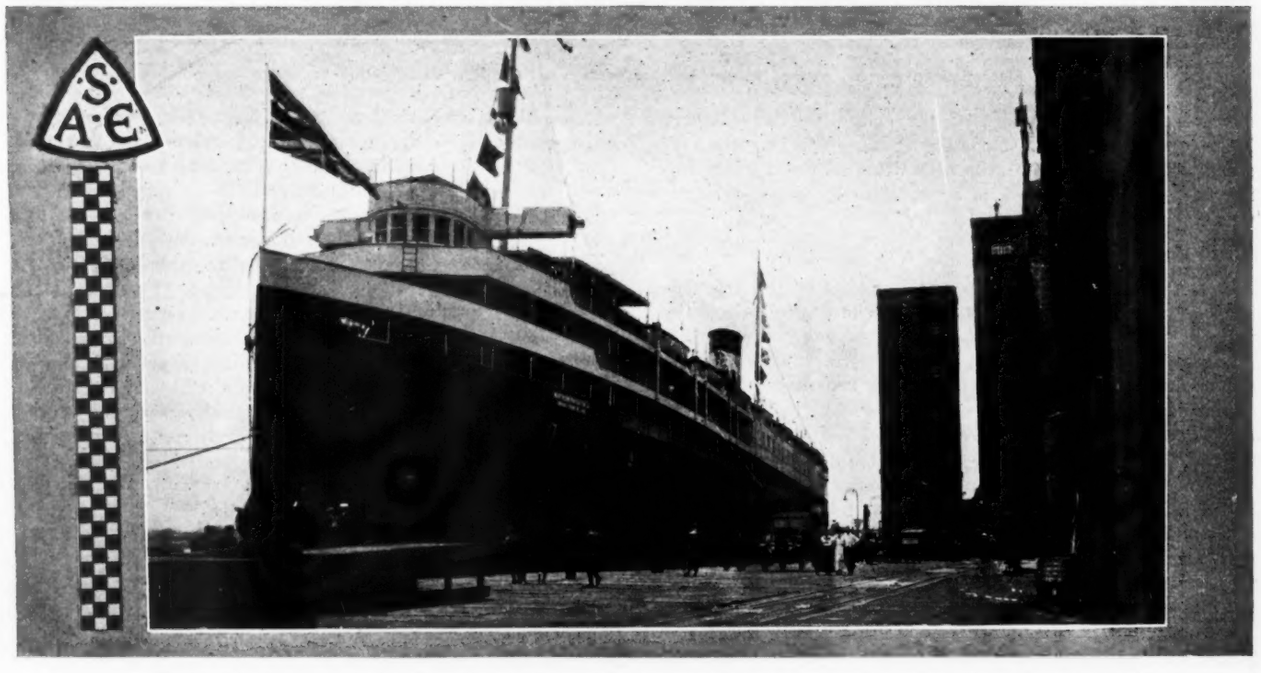
The AUTOMOBILE

Engineers Off on Lake Trip

500 in S.A.E. Party Leaving Detroit for Summer Session—Committee Reports and Papers



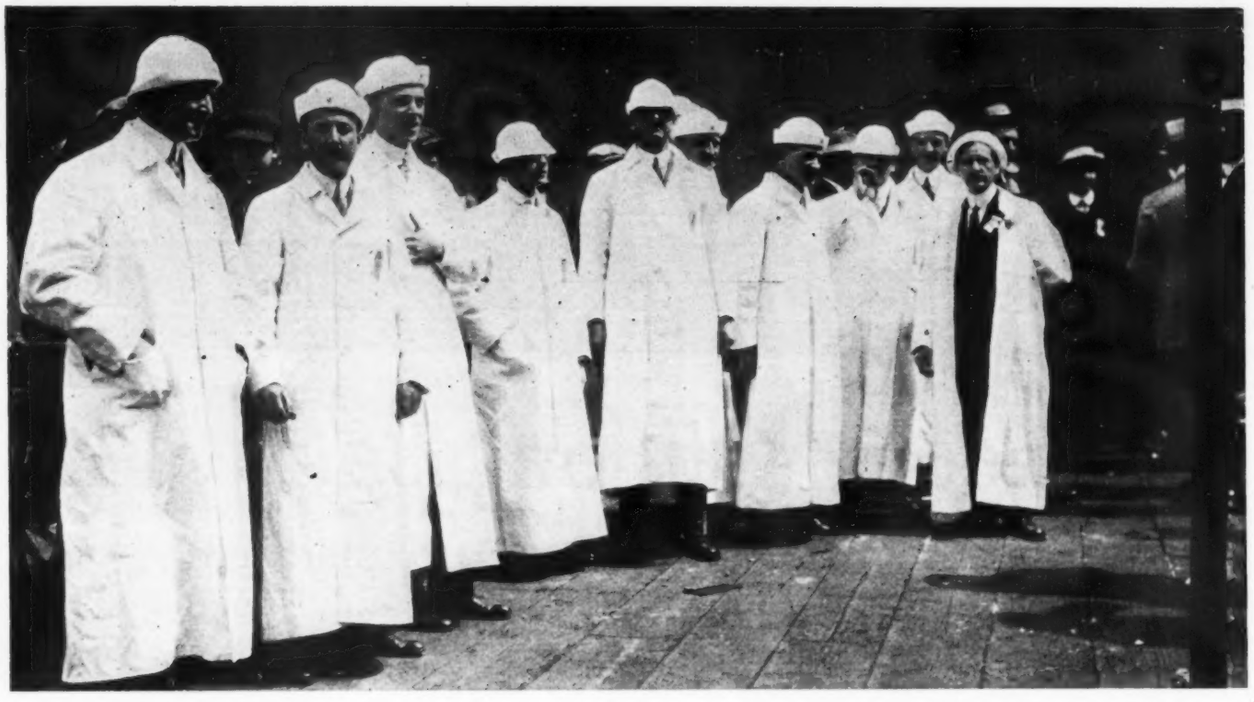
Members of the S. A. E. party boarding the Steamship Noronic for their summer session trip to Georgian Bay

DETROIT, MICH., June 14—All morning the members of the Society of Automobile Engineers, their families and friends, have been entering the home town of the automobile industry and, with the lifting of the gangplank of the steamship *Noronic* at 3 o'clock, the party of 500 was put under way for their 4-day cruise on Lake Huron and Georgian Bay, where will be held the annual summer session of the Society.

Hotel Statler, convention headquarters, presented a busy scene all morning. At shortly after 8 o'clock the members of the party of the Metropolitan section, numbering fifty-seven, arrived on a special section of the Wolverine from New York. They were accompanied by many from the Philadelphia and New England territories and were met at the depot by the Detroit committee. Shortly after the Indiana delegation, numbering fifty, put in its appearance followed by numerous arrivals from scattered points. Detroit itself is well represented on the trip.

Among those taking the trip are President and Mrs. W. H. Van Dervoort, Mr. and Mrs. J. W. Zimmerschied, Mr. and Mrs. G. W. Dunham, Mr. and Mrs. Russell Huff, Mr. and Mrs. John J. Utz, Mr. and Mrs. E. E. Sweet, Mr. and Mrs. H. W. Alden, Mr. and Mrs. G. P. Dorris, Mr. and Mrs. J. S. Critchley (England), Mr. and Mrs. Alfred Reeves, Mr. and Mrs. C. B. McKinley, Mr. and Mrs. C. H. Foster. Among the former presidents who are on the trip are Howard Marmon, Howard Coffin, Henry Souther and H. W. Alden.

Important progress is looked forward to at this meeting and men of importance to the automobile industry are on board the *Noronic* to discuss the broad fields covered by the papers and the reports of the standards committee. The reports of eleven divisions of the latter are expected and the



A group of the Metropolitan section attired in their white coats which lent a picturesque touch to the embarcation

representation of members of the committee is sufficiently large to make it certain that a big advance will be made. The steps taken by the standards committee at the Spring meeting in this city will also be acted upon by the society as a whole.

500 in Party

Arrangements for handling the business of the trip have been so far shown to be complete. The Detroit committee provided automobiles for transporting the engineers from the incoming trains to the hotel headquarters. Those who had not made steamer reservations found a representative of the steamship company and all facilities for securing quarters on the boat. Registrations were made on the boat and at the time of sailing over 450 had signed with many still to come.

Even before the gangplank was lifted the engineers on board were preparing for the business meeting which is to start at 3 p.m. today. President W. H. Van Dervoort's party was among the early arrivals and the presidential address was about to be given as the *Noronic* gathered headway up the Detroit river.

The business for this afternoon calls for the reading of the presidential address, treasurer's report, report of the membership committee and the election of the nominating committee officers, together with any other business matters to be discussed before the professional session. The papers scheduled for this afternoon are three in number, covering automobile clutches, by W. F. Herst; a formula for comparing the performances of automobiles, by C. T. Myers, and a scientific method for testing electric vehicles, by T. H. Schoepf. This in connection with the business session gives a busy afternoon for the first day. The complete program as published in THE AUTOMOBILE for June 3, page 1,000, has not been altered, with the exception of an additional paper by A. P. Brush on scientific chassis design.

Specifications of Steels

Of premier importance is the report of the iron and steel division to be made by chairman K. W. Zimmerscheid, metallurgist of the General Motors Co. This contains the physical specifications of the S. A. E. carbon steels giving tensile strength, elastic limit reductions of area, elongation and hardness of S. A. E. steels No. 1020, 1025, 1035 and 1045 which are carbon steels of .20, .25, .35 and .45 average carbon content. In addition specifications are given for screw stock steel castings and some of the alloy steels with notes on their heat treatment and use. Along with the complete report on the physical characteristics of the steel, complete notes are given on the heat treatment. According to the S. A. E. Specifications, eight standard carbon steels are recognized, two of these being special, for screw stock and steel castings. In addition the report covers five nickel steels, fifteen chrome-nickel steels, seven chromium steels, two silico-manganese and two iron casting materials, one for the gray iron and another for malleable.

Tests of Automobile Steels

Results of physical tests given in the report are from standard S. A. E. test pieces and have been obtained on specimens prepared from sections common in automobile use. Taken altogether, the report furnishes highly desirable information on the use of steels for ordinary automobile purposes together with the proper heat treatments for these steels.

Electric Equipment Progress

Three topics for discussion are being submitted by chairman A. L. Riker, engineer of the Locomobile Co. of America, for the electrical equipment division. These cover the standard dimensions on bulb basis, sockets and plug ends for the single-wire system, standard tests for headlight limitation, and a progress report on the standard mounting of starting motors.

The proposed standard for lamp fittings will give full dimensions and tolerances and the headlight illumination subcommittee is proceeding in the direction of recommending standard tests for headlight illumination which will be suitable for use by police officials. No attempt is being made to develop or approve any particular device but the considerations are the distance at which the headlight should provide

illumination, maximum height of beams from the ground and the control of the light from the seat.

Two Electric Motor Types

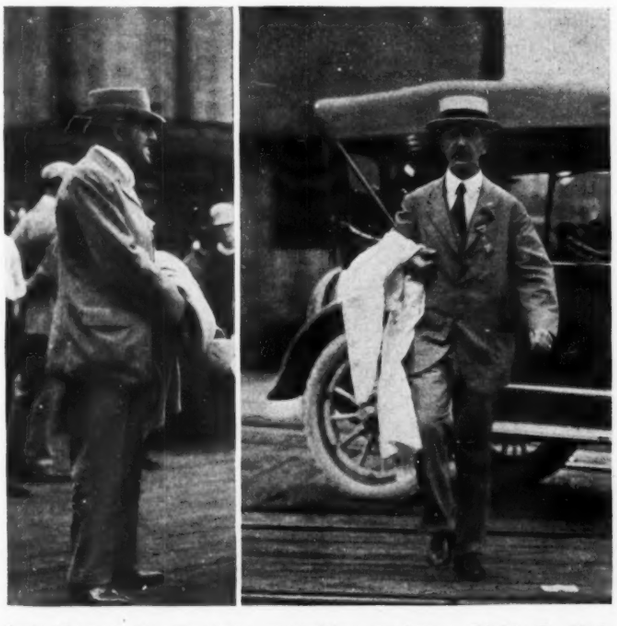
The electric vehicle division, through chairman Arthur J. Slade, is recommending two classes of motors for use on electric vehicles, one designed for 80 to 85-volt operation and the other of from 60 to 66 volts; a standard name plate has been arranged and definite numbers of cells as standard battery equipment. Progress reports are also being made by this division on a new speed and mileage rating and a schedule covering the size of car wiring and battery assembly.

Standards for Springs

In the nature of a review, is the report of the springs division through chairman C. W. McKinley, engineer of the Overland company. The results of the previous 1914 meetings are brought before the Society in considering standardization of master leaf lengths, nomenclature of cantilever springs, frame brackets nuts for spring clips, center bolt nuts, etc. It has been suggested that the master leaf length increase in even inches from 26 as a minimum up to 66 as a maximum, but the committee is not in favor of this. Cantilever nomenclature is the same as of previous reports but the division recommends that the tolerance on bush eyes of leaf springs, as adopted at the January, 1913, meeting of the Society, be changed.

Fan Belt Standards

Eleven subjects are touched upon by the miscellaneous division in the report made by Chairman, J. G. Utz, consulting engineer of the Perfection Spring Co. Two of these are matters for standardization and the remainder are progress reports. The two matters for standardization are fan belt and pulley width and a table of cotter pin sizes. Progress reports are made on the thickness of fan belt, width of piston rings and grooves, speedometer drive, radiator hose and clamp, screws for cowl board mountings, thickness of brake and clutch facing material, location of engine, chassis and car numbers, limits of tolerance on S. A. E. bolt thread and redrafting of standards for mechanically driven tire pumps. The division also reports that it has not been able to make progress upon standardizing license tags or upon standards for oil and gasoline.



Left—George W. Dunham, consulting engineer. Right—R. McA. Lloyd, consulting engineer, chairman meetings committee

A group on the pier—Henry Hess, president Hess Steel Co., Schwarz Spring Co. and Hess-Ives Corp., and Henry Souther, vice-president and general manager Ferro Machine & Foundry Co., a past president of the Society, and Walter C. Allen, sales manager Bijur Motor Lighting Co.

On the fan belt and pulley widths, four sizes are recommended as standard. Namely, 3-4, 1, 1 1-4 and 1 1-2 inches. A list of tolerances for each of these sizes is also given. On the cotter pin sizes, forty-one recommended sizes are given to take the place of 250 to 300 now in use.

Most important among the progress reports of this division, is a list of piston ring and groove widths for different sizes of pistons for 2 to 7 inches in diameter. There is also a suggested speedometer drive to screw into the side of the gearset.

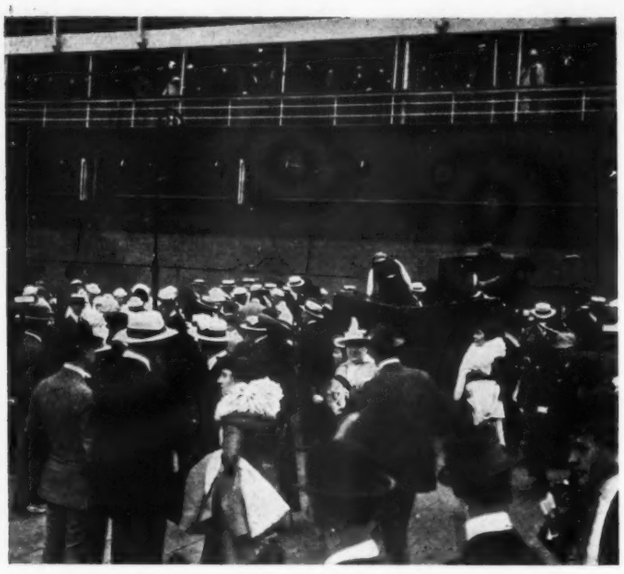
New Carbureter Sizes

The carbureter fitting division under chairman Jerome J. Aull, mechanical engineer of the Lunkenheimer Co., in reporting on a number of suggestions brought up since the adoption of a standard side-outlet carbureter at the last summer meeting, is against the standardization of the dimension from carbureter centerline to face of flange as restricting carbureter design. It favors the two-bolt vertical flange for all sizes, up to and including 2 inches and the four-bolt flange for sizes above 2 inches. It recommends the standardization of the carbureter air heater which should be integral with the exhaust manifold casting. Besides this the division is in favor of standard 1-2-inch and 5-8-inch sizes.

Size and Inflation of Tires

T. W. Litchfield, factory manager of the Goodyear company, in his paper on Size and Inflation of Pneumatic Tires, declares that fully 33 per cent. of all automobiles are overloaded to such an extent that serious tire trouble and expense are inevitable, and that at the present time only a small percentage of American cars are properly tired from the economical standpoint of the car purchaser. Owing to too small tires which must be inflated to a high pressure, there is a relatively poor cushioning condition, and the source of motor troubles and general breaking down of car are traceable to this condition. Car owners are losing many millions of dollars per year because tires are too small to carry the loads placed on them. Practically 30 per cent. more tires are worn out each year than should be worn out if they were of the correct size and carrying the proper load.

In actual practice the size and inflation of tires should be settled by each individual car. Mr. Litchfield recommends carefully weighing cars in order to determine the proper tire size. To get the actual load on each tire the front of the car



Scene when the Noronic was just about to cast off with the S. A. E. party going on board

fully loaded must be weighed, then the rear similarly weighed and each weight should be divided by two, thus getting the load on each tire.

Both the car manufacturers and tire manufacturers are to blame for existing tire conditions. Mr. Litchfield does not favor too small a tire with too high an inflation but rather a larger tire with the proper inflation for the load. Distortion is one of the great causes of tire difficulties and there are two general aspects of this, first the flexing of the tire carcass and second the surface motion of the tread. It can be accepted as a law that the wear of a tire in cents per mile varies at least as the square of the load. In other words, if you increase the load on a tire 10 per cent., keeping inflation and other things the same, the average life of a tire will be at least 17 per cent. less for ordinary sizes. The wear on a tire is often found to vary more than as the square of the load but never less.

Mr. Litchfield lays down three laws governing tires:

1—Under given conditions of operation the total running expense for a given load is independent of the size of tire used providing the inflation pressure is so regulated as to keep the percentage of deflection a constant.
2—If the best conditions for carrying a given load are obtained at a certain percentage of deflection the best conditions for any load on the same tires will be obtained at the same deflection.
3—There is a certain fixed percentage of deflection corresponding to general best results which may be applied to all tires alike.

Military Truck Design

Four requirements for a satisfactory design of military truck, according to Jerry W. De Cou, factory manager for the Jeffery Co., are: 1, good clearance; 2, strong hook in front and rear for towing; 3, sprags and four quickly applied non-skid chains. These are the four essentials as determined by experience at the front and do not take into consideration the questions of chassis design. Mr. De Cou describes the Jeffery four-wheel design of truck, picking out many features that make it best suited for military uses, such as: There are front and rear steering connections which are alike; the four main springs are alike; driving and steering are through four wheels; every important adjustment can be made without disassembling; having the truck reversible, with the same speed as forward, specially adapts it for use in the firing zone; and the automatic locking differentials which put the power into any wheel or wheels insures traction where such is not possible without these differentials. There are two of these differentials, one in the front power axle, and one in the rear. The axle is such that none of the road wheels of the truck can lag in speed behind the motor. The two outermost wheels can overrun the inner ones in turning a corner, but as soon as any wheel tends to lag behind the motor the differential locks automatically and the axle driving shaft is virtually solid from wheel to wheel.

Aluminum Alloy Pistons

Eugene Gruenewald, engineer of the Moline Co., in his paper on aluminum alloy pistons, reviews the situation as it stands at present, and points out that the addition of a small percentage of magnesium to the aluminum has resulted in the production of sounder piston castings, with better physical qualities. The tensile strength of the light-metal alloy is about the same as the average cast iron piston; that the head should be 1-32 to 1-16-inch heavier or else reinforced by ribs. The question of clearance is pointed out as particularly important due to the different co-efficient of expansion from cast iron, and according to the author, between .003 and .004 more clearance than in cast iron practice must be allowed. Among the advantages of aluminum are the freedom from carbon, less vibration, good wearing qualities and freedom from loose bearings. The disadvantages are great clearance necessary and the consequent light piston slap for the first few explosions. Commercially, aluminum alloy pistons are now produced at a cost slightly in excess of cast iron.

Factors in Spring Design

C. H. Gleason, designing engineer of the Kalamazoo Spring and Axle Co., in a paper on spring design mentions four points as basicly affecting spring design. These are, weight of car, load to be carried, speed at which the car is to run and wheelbase. The worst possible conditions under which the car will be operated must be considered and the spring suspension designed accordingly.

Speaking of the reaction of a spring, Mr. Gleason believes this will be determined largely by the length and the shape. The camber is of great effect in that an excessive camber gives a sharp reaction whereas a flat spring is lazy in its action. Friction between the plates and the proportions of the spring has its effect on the action.

Mr. Gleason holds that a semi-elliptic spring is at its greatest efficiency when the centerbolt is on center. Care must be given not to affect the bolts too much on front springs, for although road shocks are better endured the efficiency of the spring action is impaired. In three-quarter elliptics the front portion should have a deflection equal to that of the combined two rear parts. Some other aphorisms in the paper are:

A spring is at its best when it is horizontal and its master leaf is straight.

Nothing is gained by using a narrow spring.

When a spring is used as a driving member it is desirable to compromise a little in the deflection.

The spring should not be decided after the axle and frame have been determined, but should be selected first.

Spiral Type Bevel Gears

A. L. Stewart, of the Gleason company, large gear manufacturers, in speaking of the spiral-type bevel gears says they are more efficient than worm drive and equally as quiet. In a recent test of two electric cars, one with a worm-drive axle and the other with a spiral-type bevel, the worm-drive ran 72 miles on a charge, and the spiral-bevel type 95 miles. Both cars were alike. The essential feature of the spiral-type bevel is that the tooth is curved, whereas in the conventional bevel-gear it is straight. There are many advantages of the spiral-type bevel. One is that you can use a higher gear ratio than with a straight bevel. In straight-tooth bevels 4 1-2 to 1 ratios have been the dividing line between quiet and noisy rear axles, whereas with the spiral-type bevel, ratios of 5 or 6 to 1 give satisfactory service. The spiral-bevel is quiet, which is due to the overlapping of the teeth. A

great advantage of the spiral-type bevel is the endwise adjustment of the pinion, which is possible without reducing materially the amount of bearings or introducing noise. The spiral-bevel type is a stronger gear than the straight-bevel, notwithstanding the fact that the total load on the tooth of the spiral-bevel is 15 per cent. greater than on the straight tooth. To offset this extra load the spiral-type gear has more teeth in contact at all times than the straight tooth gear, and so the load is distributed with the net result that there is less load on each tooth of the spiral-bevel than there is on the conventional straight bevel.

Pressed Steel Wheels

According to Orrel A. Parker, manager of the Wheel Department of the Hydraulic Pressed Steel Co., in his paper on Pressed Steel Wheels for Passenger Cars, it is possible to make a pressed steel wheel weighing only 53 per cent. of the usual wood wheel and yet have the steel wheels slightly stronger. His paper is based on a series of sixty tests extending over 4 months and made by the Case School of Applied Science, Cleveland. In these tests the pressed steel wheel manufactured by Mr. Parker was tested against wood wheels of other makes. The following are some of the results: Tests of 36 by 4 1-2 inch steel and wood wheels showed a higher deflection of the wood wheels than the steel. The steel wheels are lighter than wood in that they are made without felloes, the rim of which carries the tire attaching direct to the wheel spoke.

Different Tractor Types

Frank H. Trego, Chief Engineer of the Knox company, in his paper on road tractors, divides this type of vehicle into three broad classes; first, the pure tractor vehicle designed primarily for pulling and used frequently for pulling ploughs, threshing machines and road building machinery. They are slow moving vehicles, and only for extremely heavy hauling. The second type, is a four-wheel, power-driven, vehicle of short wheelbase, constructed to support the front end of a two-wheel trailer. This may be called a semi-truck. The third is one in which the frame supporting the mechanism seats and steering devices is not extended to the rear for the support of the front of a two-wheel trailer, but has this trailer, supported on an independent axle with independent springs and fifth wheel.

It is with the third type of construction and its merit that Mr. Trego deals. The advantages for this are the possibilities of using light-weight springs, a firm support for the front end of the trailer, a shock absorbing device for starting and stopping loads, by the use of the cantilever springs for the support, and easy riding. Generally, Mr. Trego believes the truck tractor to have advantages over a truck because the bulk of the pay-load rolls on steel tires instead of rubber, the weight is spread over three axles, the radius of turning is shorter and it is possible to keep several varieties of bodies going at the same time. On going over figures, for draw-bar pull, Mr. Trego estimates that the limit to the pulling power of rubber for a given surface can be reached in actual practice and at the point which must be given consideration.

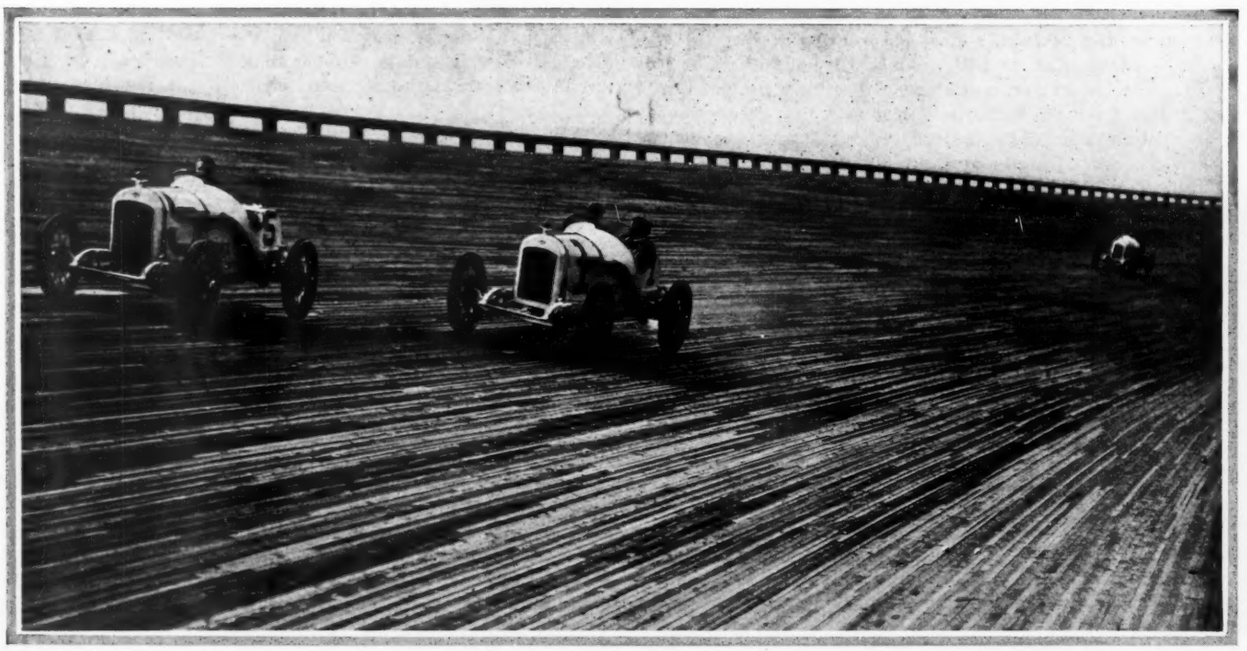
Clutches Save Tires

A bad clutch, carelessly operated, will reduce the life of the rear tires from 20 to 25 per cent. according to the paper by W. F. Herst, factory manager of the Brown-Lipe Gear Co., entitled Automobile Clutches. The clutch should not be of too great capacity, should release quickly and it is advisable to fit some type of clutch brake to facilitate gear changing.

Mr. Herst divides clutches broadly into two types, cone and disk. With the cone clutch the angle should be somewhere between 9 and 12.5 degrees, with the latter preferred, as it prevents trouble in releasing. The leather should be the best obtainable and should be frequently treated with neatsfoot oil to keep it soft. If asbestos fabric is used it should be soft and thoroughly carbonized.

In speaking of the disk type Mr. Herst believes the steel-to-steel type to be superior to the steel-against-phosphor-bronze ones as the former have been giving better satisfaction. Proper oiling is the greatest requirement with a clutch of this design to prevent it from overheating.

Earl Cooper, in Stutz, Makes 109.2 m.p.h. on Chicago Speedway



The three Stutz cars driven by Earl Cooper, Howard Wilcox and Gil Anderson on the new Chicago speedway. Besides covering a lap of 2 miles at an average of 109.2 m.p.h., Cooper averaged 106.19 m.p.h. for a 20-mile stretch. After this demonstration Cooper prophesied that the 500-mile race to be held on Saturday will be won in 5 hours.

$200,000,000 for Kansas Farmers—Car Sales Boom

Market Growing in Grain States of the Mississippi Valley —Registrations Gain Rapidly in Rural Districts—Kansas Gains 442 Per Cent. in 5 Years—Jitneys Are Flourishing

KANSAS CITY, MO., May 31—With the wheat harvest in Kansas almost ready to begin it looks as if the winter wheat states were going to repeat the performance of last year and roll up another tremendous ready money crop. The Turkish forts still hold at this writing and if they should fall, it is believed by grain men generally that the price of wheat would be very little affected by the opening of the Dardanelles to Russian grain. There might come a quick drop as was the case at the beginning of the attack but the grain men believe it would go back up again.

Cash wheat is worth today on the farms $1.30 to $1.40 and the farmers who are still supplying wheat to the mills of the western states are getting that for it. However, there is very little wheat left on the farms now. The mills have enough to run them until the new crop comes in. And if any farmer is worried about the price of wheat he can sell at from $1 to $1.10 a bushel on future delivery.

The first estimate of the new wheat crop which Kansas will begin to harvest the middle of June has just been made. There have been estimates on acreage before, but the estimate made May 24 from a close observation of the wheat in the fields shows Kansas will produce 136,000,000 bushels of wheat. This is 40 per cent. larger than any previous crop except last year when Kansas produced the greatest crop in its history and sold it at the greatest price, 180,000,000 bushels at from 90 cents to $1.48. The average wheat crop in Kansas is 70,000,000 bushels. With wheat at war prices, Kansas will get for the crop this year close to $200,000,000 in cash that will come in from Europe and the eastern states.

Just imagine $200,000,000 brought into a state to buy what the farmer likes. And there is Kansas with its $15,000,000 alfalfa crop coming fine and all its cattle and hogs. Of course, Kansas is the greatest of the winter wheat states. Nebraska will produce this year, however, close to 60,000,000 bushels of winter wheat and Missouri will produce 40,000,000 bushels. Oklahoma will produce the greatest crop of its history, estimated this year at 60,000,000 bushels. So, making a broad estimate, Kansas, Nebraska, Oklahoma and Missouri, the "big four" of the winter wheat states, should produce this summer close to 300,000,000 bushels of wheat—296,000,000 bushels to be exact. And at $1.50 prices, which may be expected if the war continues, it means that the Southwest will have cash money crops by July that will amount to $450,000,000, which ought to be good news to the motor manufacturers.

The rains the middle of May, which produced 4 inches of water in 3 days over all the grain states, insured the wheat crop. No more rains before the harvest will be necessary. The chinch bugs and the Hessian fly which have done considerable damage were killed by the deluge of water.

Reports from the spring wheat states are equally encouraging. The "big three," North Dakota, South Dakota and Minnesota, report good growth and while the crop, of course, will not mature until much later than the winter wheat, there is every reason to look for a big crop on account both of the acreage and the spring rains. Nebraska of late years has become almost entirely a winter wheat state, but this year it will have the usual amount of spring wheat. The outlook in the spring wheat states based on the acreage is:

	ESTIMATED ACREAGE	ESTIMATED BUSHELS
North Dakota	8,000,000	120,000,000
South Dakota	3,750,000	60,000,000
Minnesota	4,500,000	65,000,000
Nebraska	300,000	6,000,000
Total	16,550,000	251,000,000

This makes 251,000,000 bushels of wheat in the spring wheat states, worth at estimated war prices, $375,000,000. That gives, approximately, $825,000,000 in the spring and winter wheat states in cash for the 1915 crop and all cash to come from outside those states!

Corn in the corn belt of the western states is in good shape, the rains having given much moisture. Here is a brief table that gives an estimate of what may be expected from a normal corn crop in the big corn states of the West:

STATE	1914 SHORT CROP	NORMAL CROP
Iowa	389,000,000	400,000,000
Kansas	108,000,000	175,000,000
Missouri	158,000,000	200,000,000
Nebraska	175,000,000	200,000,000
Oklahoma	50,000,000	100,000,000
Total	880,000,000	1,075,000,000

A total of 1,000,000,000 bushels that will average in price anywhere from 50 to 75 cents, a total of from $500,000,000 to $750,000,000. Wars do not usually affect greatly the price of corn.

The other field crops in the Southwest and Central Western states are doing well. Oats and all other small grain have had plenty of moisture.

442 per Cent. Car Increase

The grain states of the Mississippi Valley may all be judged from the condition of Kansas, which raised nearly half of the winter wheat in the western states. It is of unusual interest to note the way in which automobile sales have increased in Kansas, which represents probably more than any other state, the farmer himself. Since 1910 the increase of motor cars in the state has been 442 per cent. The increase for the whole United States has been in the same period 240 per cent. Of the states that have 20,000 cars in use, Kansas's percentage of increase has been exceeded by

¶ This is the third of a series of monthly industrial reviews on conditions in the southwestern territory embracing such states as Kansas, Missouri, Nebraska and Oklahoma, which comprise an important section of the Mississippi Valley, one of the greatest grain-producing regions in the world.

¶ Higher grain prices and an unprecedented demand for horses and mules for the European armies render this region particularly important as an automobile and motor truck market at the present time.

¶ The author is one of the most widely recognized authorities in this territory, having watched the progress of these states for 25 years while in daily contact with their leading financial and industrial movements.

only one state, Minnesota, great in spring wheat and dairy products.

This increase by years from 1910 shows:

March, 1910	9,301	gain
March, 1911	14,456	5,115
March, 1912	18,625	4,139
March, 1913	24,794	6,169
Jan. 1, 1914	34,945	10,151
Jan. 1, 1915	50,454	15,509

To these figures may be added an increase of 2,000 cars since that time. A list of cars in Kansas gathered from various counties on March 15 showed some interesting figures on the distribution of the various makes as follows:

Ford	19,411	Metz	311
Buick	5,430	Krit	281
Overland	3,987	I. H. C.	273
Studebaker	3,982	Brush	259
Reo	2,246	R. C. H.	207
Maxwell	2,180	Case	207
Cadillac	778	Paige	173
Chalmers	732	Cartercar	133
Mitchell	730	Saxon	131
Auburn	671	White	107
Hupmobile	663	Oldsmobile	106
Hudson	622	Everett	106
Oakland	613	Cole	105
Jackson	605	Lambert	103
Regal	517	Miscellaneous	4,558
Velie	388		
Rambler	385	Total	51,000

The figures given herewith represent the total of each different make except where the cars registered a total of less than 100 and they are included in miscellaneous. There are 353 different makes in the state and 320 have less than 100 in use.

The survey of the car users in Kansas serves as a lesson in what the farmer means to the motor car industry. Kansas has only one large city, Kansas City, and that city has less than 100,000 population. The other cities of the state are county seat towns mostly running from 1,000 to 5,000 population. There are two or three exceptions, Topeka, Leavenworth, Wichita, Atchison and Hutchinson, but with the exception of Topeka all represent the farmer and all live from the farmer's products. It is interesting to note that a survey of the industry in the state shows that where the towns are smallest the number of persons per car is likewise smallest.

Pawnee county in the central part of the state, where wheat rules, has 547 cars with an average of only fourteen persons per car. Almost as good a showing is made in Edwards and Lincoln counties with an average of fifteen persons per car each. Such thickly settled counties as Barton and Reno show averages of twenty-two persons per car each. And in Barton county are several small towns and in Reno the town of Hutchinson with a population of 16,000.

75,000 Cars for Kansas

The writer is able to give the figures of every county in the state with the number of cars and the number of persons per car, also showing the remarkable way in which the average of persons per car is going down. The moral, of course, is that where there are twenty-two persons per car in a county filled up with average sized farms, some small towns and a city the size of Hutchinson, every other county in the state, barring possibly the counties with towns of more than 50,000 can be made to have as low a percentage. This means that Kansas, with a population in 1914 of 1,672,106 could be showing the use of 75,000 cars without difficulty, and if the lowest percentage of any county in Kansas were reached over the entire state, the number of cars in used would be 111,474, more than twice as many as are in use at present.

And is there any reason why a rich Kansas county should not have as few persons per car as a county that is poorer in wealth, which is the case in a third of the 105 counties of the state?

Kansas City, third as a distributing center for motor cars, is sold out. Branch houses and agencies for territory extending over the Southwest have cleaned up 2 months before the 1916 product is expected. A committee of three managers of Kansas City motor houses went with the Kansas City Commercial Club a few days ago on a trade extension trip through Kansas and Oklahoma. They made diligent inquiry in every town they visited regarding the sale of 1915 cars and the outlook for the next year and when they had completed half of the trip they sent this telegram to E. E. Peake, secretary of the Kansas City Motor Car Dealers' Assn.:

With the trade trip of the Commercial Club half over, the opinion is universally expressed that this will be a record year. Conditions all along the route back up the optimistic prophecy that automobile sales will be simply enormous and will tax the capacity of all the factories to supply the demand.

J. F. MARTIN, Kansas City Buick Branch Manager.
A. F. NORTON, J. I. Case T. M. Co.
C. W. SCARRITT, Bond Motor Co.

Ford Delivers 1,000—Turns Down 2,000

And this expresses the opinion of all the representatives of the automobile manufacturers in Kansas City. If one wanted to buy a new car in Kansas City today he would have to go to half the dealers in town before he could find a car. Probably there are not to exceed a dozen new machines in town. The Ford company, which has an assembling plant in Kansas City, delivered 1,000 cars in Kansas and western Missouri last month, and had to turn down 2,000 orders for delivery within that time. The Ford plant, as a result of the heavy demand from the grain states territory, has announced the immediate beginning of work on an addition to the plant here in Sheffield, a suburb of Kansas City, that will more than double the output. The new plant will have a capacity of 2,000 cars a day.

Buick Working on 1916 Allotment

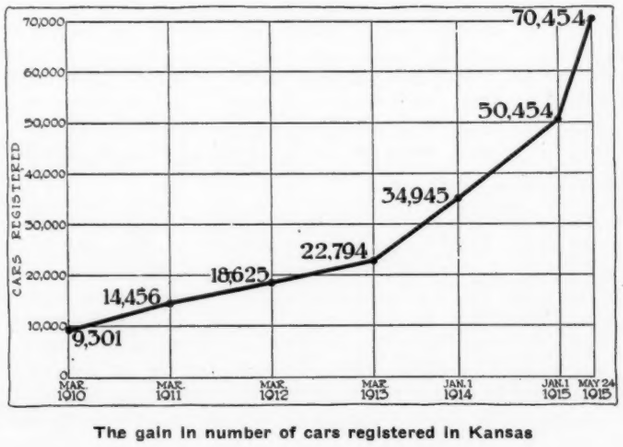
The Buick company sold the last of its 1915 cars May 5 and since that time has been taking orders for the 1916 cars. Right along this line is found comment by representatives of automobile manufacturers that the industry has become so thoroughly established that buyers, especially those that have driven a certain make of car, are placing orders before they even see the specifications of the model of the car they expect to purchase.

The Overland company, like the Buick, is sold out and the same is true of the Studebaker. The latter company has been bringing cars from other points to supply the remarkable demand in the Kansas City district.

The manufacturers of the eights, as well as the sixes and fours, all report the same heavy sales. The increase for the year to date shows approximately 70 per cent. over last year in the popular-priced models and somewhat less in the higher-priced cars.

The jitney continues to flourish in Kansas City which has been pronounced the jitney center of the United States. For

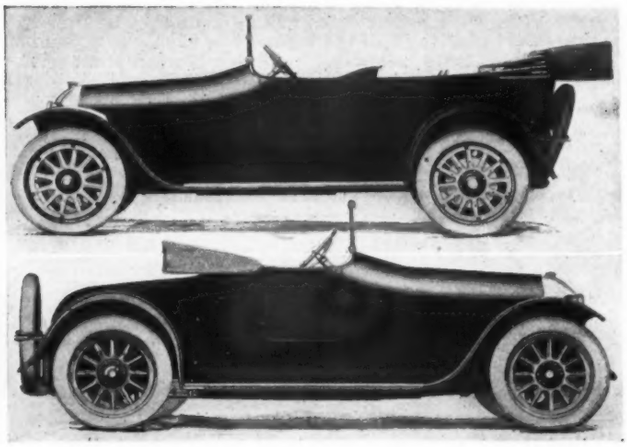
(*Continued on page* 1084)



The gain in number of cars registered in Kansas

Pathfinder Twelve and Six for 1916

Twelve-Cylinder Continental Valve-in-the-Head Motor 3 by 4 Inches Is Interchangeable with Six-Cylinder in New Chassis



Above—Fremont model Pathfinder six-cylinder touring car for 1916, with complete equipment selling for $1,695. Below—Roadster body mounted on the same chassis and selling at the same price

THE plans of the Pathfinder Co., Indianapolis, Ind., for 1916 contain some surprising developments, these including a twelve-cylinder car in three-, four-, five- and seven-passenger form at $1,975 as well as a new six-cylinder model at $1,695 as against $2,222 for the 1915 six, the twelve-cylinder and six-cylinder motors being interchangeable in the one chassis. The Pathfinder twelve will use a Continental valve-in-the-head motor, a startling addition to the Continental factories' product as this concern has been adhering to the L-head type for many years. This makes the third twelve-cylinder announcement in the history of the world's automobile industry, Packard and National having brought out twelves almost simultaneously about 3 weeks ago.

Chassis Is New

The chassis in which the new twelve and six motors will be mounted is entirely new and differs in many respects from the former one, the wheelbase being 122 inches, as compared with 124 on the previous model, the propeller shaft hollow and open instead of solid and inclosed and the propulsion being taken through flat cantilever rear springs of new design instead of through the propeller shaft tube. The torque is absorbed by a V-shaped member on the rear of the car which uses a three-speed gearset instead of a four-speed type, 35 by 4 1-2-inch tires instead of 34 by 4 1-2 and a new braking system is employed in which only the service set is equalized. Spiral bevel axle gears are used instead of straight bevel.

Twelve Is 3 by 4 Inches

Details of the twelve are meager indeed at this time but some of the important facts concerning it are known. It is a 3 by 4-inch motor with its cylinders set at 60 degrees, each set being a block casting mounted on an aluminum crankcase. The valves are set vertically in a removable head and operated by vertical rods and rocker arms, the tappet adjustment being at the top. The mechanism at the cylinder tops is inclosed in a cast-iron housing. No valve cages are used.

Between the cylinder blocks is the carbureter with special manifolding to each block and the other motor accessories such as generator, cranking motor, etc., are carried on the right side where they are easy to inspect.

In order not to make the motor appear complicated the various parts have been separated as much as possible, thus avoiding apparent disorder and hence ease of understanding by the owner. One point which has been worked out to this end is the exhaust manifold location. In most of the multi-cylinder designs these manifolds are carried in the V and extended backward to two mufflers by means of flexible piping. In the Pathfinder installation, the manifolds are on the outside of the blocks and extend rearward to flexible tubing. This construction is somewhat like the Sunbeam twelve, although the latter has inlet manifolds on the outside and uses two carbureters.

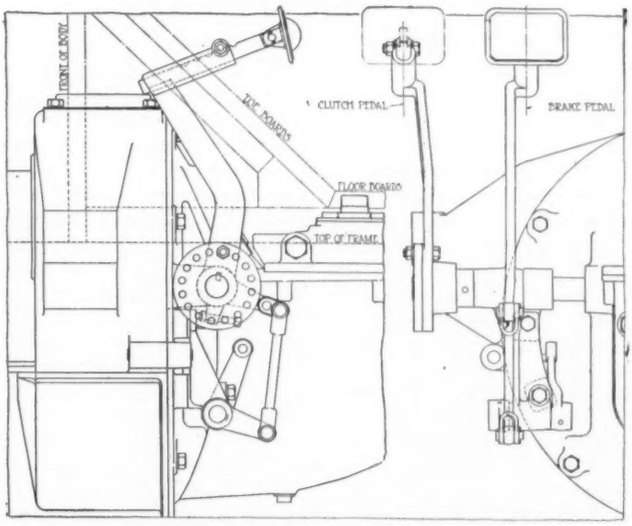
Crankshaft Like Six

Within the motor is a crankshaft which is just like that of a six-cylinder motor. The rods are said to be extremely light and the pistons of an aluminum alloy. Above the crankshaft and in the apex of the V is a single camshaft which operates the vertical valve rods.

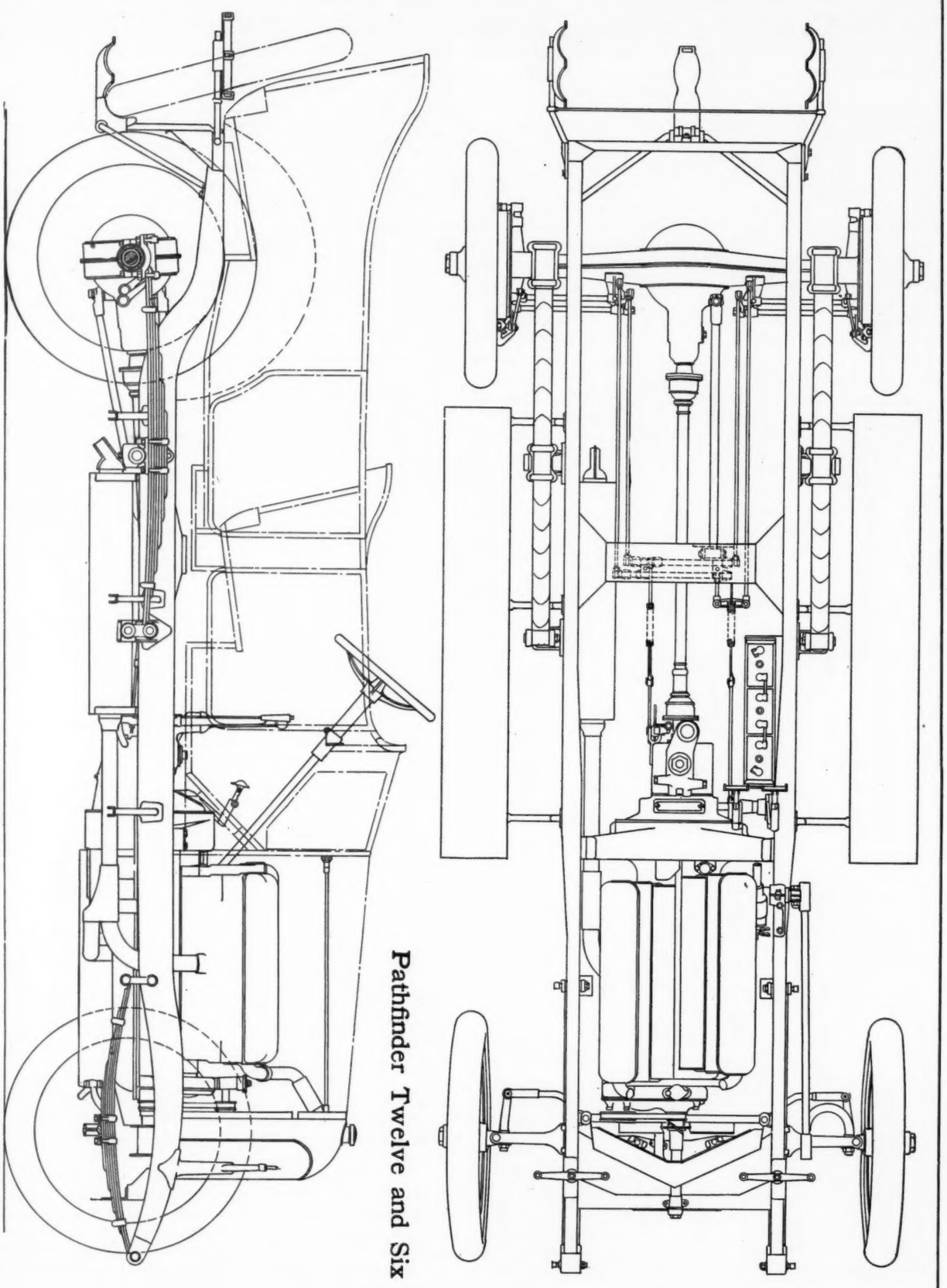
In the cooling there is a single centrifugal pump mounted on the right side of the motor and driven from an auxiliary shaft. This pump supplies each cylinder block. The oiling is said to be the same as that of other large Continental motors, there being direct leads for the main bearings and a trough system of feed for the splash, the pump, of course, taking its oil from a sump which catches the overflow from the troughs.

Special Westinghouse System

A special Westinghouse cranking and lighting system is installed and the details of this, which make it especially applicable to twelve-cylinder design, have not been made known. The starting motor, however, uses a Bendix drive and the



Pedal adjustment on the 1916 Pathfinder. Brake and clutch pedals as well as brake rocker shafts are fitted with bronze bushings



Pathfinder Twelve and Six

generator has a combination interrupter and distributer in unit, the current source being a Willard 6-120 battery mounted under the front seat.

The twelve-cylinder motor uses the same clutch and gearset in unit as that employed on the new six which makes the cars identical in every respect except cylinder number.

The Six-Cylinder Model

The new six, which as roadster, four-, five- or seven-passenger, lists at $1,695 as against $2,222 for the 1915 six, uses a Continental type 6N motor instead of the 6P. One familiar with these designs knows that the new one has 3 1-2 by 5 block cast cylinders, while the 6P has 3 3-4 by 5 1-4 cylinders cast in threes. It is stated that this engine develops 50 horsepower at 1,600 r.p.m. but this appears a little high and apparently is the rating for an unusually good motor of this type. Four-point suspension is used instead of three as last season.

The oiling and cooling systems are the same as in other large Continentals, the former being of the constant-level splash type in which a gear pump within the crankcase forces oil to the main bearings through leads and also supplies troughs under the connecting-rods. The overflow from the troughs drops to a sump from which it is picked up by the pump for re-circulation. There is nothing unconventional in the interior parts of the motor, the cast-iron pistons with three diagonally split rings, I-beam rods and three-bearing crankshaft and camshaft. The former has babbit bearings of new composition, their dimensions being as follows: front, 2 3-16 by 3 1-8; center, 2 1-4 by 2 1-2; rear 2 1-4 by 3 1-4. The valves are 1 17-32 in the clear and have nickel-steel heads welded to cambon-steel stems.

The carbureter is a 1 1-4-inch model T Schebler, a new design brought out recently and described in THE AUTOMOBILE for March 25. It is fed from a 16-gallon cowl tank. Ignition is by a battery system using a Westinghouse combination interrupter and distributer driven by worm gears from the generator shaft. The latter is an improved Westinghouse design. The cranking motor now uses a Bendix drive, the final reduction being about 10 to 1.

The new series Pathfinder chassis uses a Brown-Lipe disk clutch and three-speed gearset in unit with the motor and there is nothing of uncommon design in this installation. The clutch is a dry-disk type with fifteen plates 8 1-2 inches in diameter, the spider plates being fabric faced and the driving plates, high-carbon steel. The gearset affords the following ratios: First 13.55 to 1; second 6.83 to 1 and high 4.06 to 1.

The gearset drives a hollow Spicer propeller shaft fitted with two joints. The rear axle is a new design for Pathfinder, being a Salisbury floating type with spiral bevel gears. The differential uses Hyatt bearings, the driving pinion Gurney and the axle shafts Bower rollers.

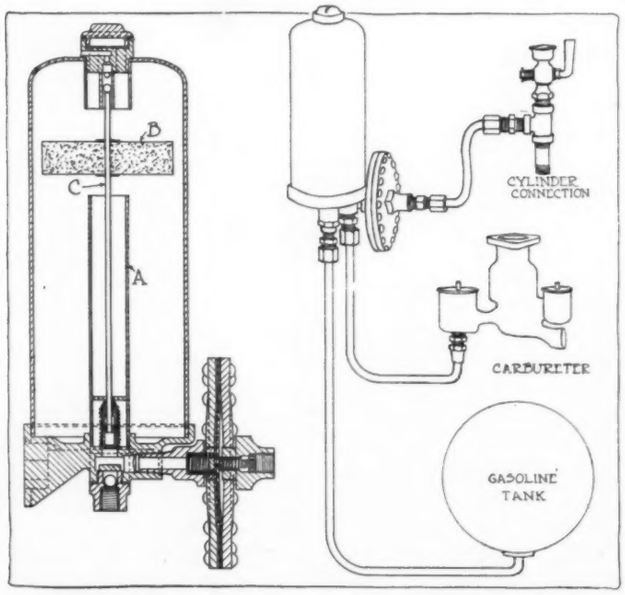
In order to make the change from torsion tube propulsion to that using the cantilever springs, the Pathfinder engineers have had to use a new frame strengthened considerably to take care of the twist at the points of spring attachment. The illustration of the chassis, page 1065, shows how this has been done. A channel cross-member 5 inches wide and with heavy gusset plates at the ends is used for bracing purposes. It also affords a means of housing the brake cross shaft, the channel portion pointing downward.

The cantilever springs are a new design and are almost

(*Continued on page* 1077)

A New Fuel System—The Carter Tank

NEW YORK CITY, June 12—A new gasoline feed device called the Carter Automatic Gravity Tank, operated by compression and suction of one engine cylinder, has been added to the automobile accessory line of the H. W. Johns-Manville Co. this city. This tank has only three moving parts with no complicated mechanism to get out of order. It consists of a container with a capacity of about 1 quart which is mounted on the engine as high as the hood will allow in the most convenient position but away from the exhaust manifold, and connected to the main gasoline tank and also to the carbureter, as illustrated. A diaphragm pump which is secured to the base of the container and also to the petcock of the nearest cylinder acts on each downward stroke of the piston in that cylinder, lifting fuel from the main gasoline tank to the Carter tank from which it flows to the carbureter intake by gravity. The Carter system may be readily attached to any car, either old or new.



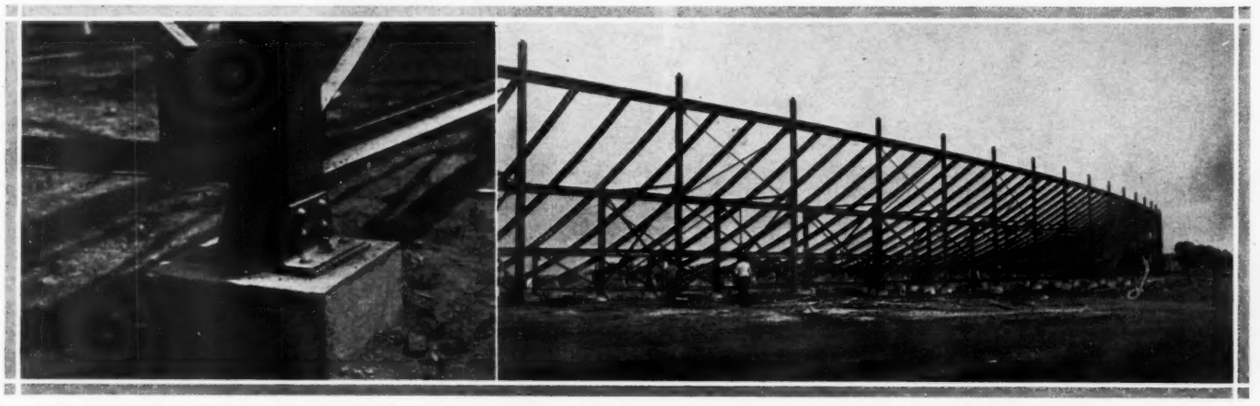
Left—Section through Carter automatic gravity tank. Right—Diagram of Carter fuel feed system

The action of the Carter system is progressive and its capacity unlimited, the fuel supply being increased directly in proportion as the engine speed is accelerated. The delivery of fuel is increased from 6 gallons per hour at 300 r.p.m. to 22 gallons per hour at 1,500 r.p.m. A sufficient difference in height between the fuel level and the carbureter inlet is maintained to insure a uniform gravity feed under all conditions, this method of mounting permitting the carbureter to be placed in its most advantageous position as close to the inlet valve as possible and also allowing it to be mounted so high as to be readily accessible and to receive the benefit of the warmth from the engine, giving the least possible area on which the mixture could condense.

Referring to the accompanying sectional illustration it will be seen that the tank is fitted with a standpipe A which insures the constant level of the fuel. A float B is mounted on the rod C having a spring check valve at the bottom and a steel breather ball at the top in the breather inlet and priming cup. The diaphragm pump is also illustrated in section. The Carter system sells for $10 complete with all necessary fittings for attachment.

Rush Construction at Sheepshead Bay

Left—The 12-foot 2 by 4 planks are laid on edge in the direction of car travel and are fitted closely by iron rods while being nailed. Right—General view of the speedway, looking from east to west



Left—Each supporting girder is on a concrete foundation. Right—The steel construction from the south end of the bank

NEW YORK CITY, June 14—Before the end of the present week nearly 3,000 men will be at work on the 2-mile Sheepshead Bay motor speedway, on which a 350-mile race is scheduled for October 2. Up to date the steel framework being used for the track on the curves at each end is up for one end, and the laying of the 2 by 4 timbers for the track proper has begun. On the straightaways the board surface is being laid on cement cross girders, and all of these are in place on one straightaway and will soon be completed for the other. The laying of the track surface on the back stretch is at present under way. Slower progress is being made on the steel framework at the other end of the track, the work on which has not yet started, due to a heavy fill having to be completed. The cement piers for the grandstand and bleachers are being poured and the steel work for the grandstand is on the ground.

The banking on the curves is most impressive, the steel girders being hollowed so that the curve from the inside of the track to the outside is a paraboloid rather than a straight line as in the Chicago track. The width of the track on these curves is 78 feet, the inner third being supported on cement girders which are continued into the steel girders. The steel construction is particularly rigid, every alternate tier being in the form of a steel tower braced transversely and diagonally. The track is 70 feet wide on the straightaways and an inside safety apron of solid turf approximately 30 feet wide runs all the way round. Inside this comes the cement safety retaining wall.

The grandstand will be a covered two-story steel construction seating 28,000. On the opposite side of the track is an uncovered bleacher stand for 30,000 spectators, which brings the total seating capacity up to 58,000.

To Cost $710,000

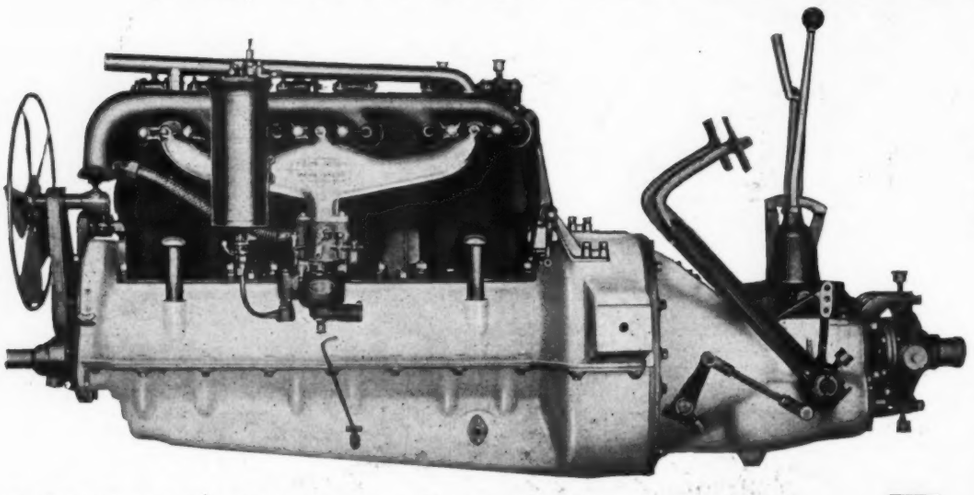
According to present estimates, the total cost will approximate $710,000, divided as follows: Grandstand, $260,000; track, $250,000; buildings, fences and other improvements, $200,000. Over 5,000,000 feet of lumber is being used in the track surface.

There are 1,000 grandstand boxes. On the inside of the track opposite the grandstand are forty repair pits, each 20 feet long. There is a neutral apron 40 feet wide in front of these, paved with brick.

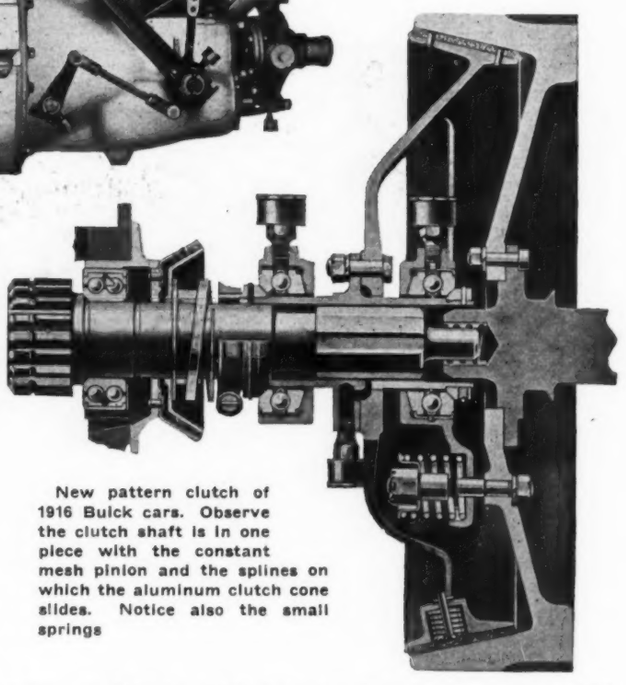
Concrete foundation on the straightaways of the course

1916 Buicks Are Both Sixes

Improved Clutch and Carbureter on Both Chassis—Small Six at $985 To Be Principal Product—Main Features Retained



Left—New small six Buick motor with block cylinders. The water pump and the Delco combined generator and motor are the only fittings on the other side



New pattern clutch of 1916 Buick cars. Observe the clutch shaft is in one piece with the constant mesh pinion and the splines on which the aluminum clutch cone slides. Notice also the small springs

SEEING that the Buick Motor Co. introduced its first six-cylinder model only 2 years ago and that the popularity of the four-cylinder has been so great, it comes as somewhat of a surprise to learn that only sixes will be built in the great factory at Flint, Mich., for the coming season. There will be two chassis with roadster, touring, coupé and sedan bodies as a choice on the smaller, but the larger chassis will be offered with only roadster or touring body. There is not much difference in size of chassis, but the touring body on the smaller chassis seats five only while that on the larger holds seven.

Improved Manufacturing Processes

When a well known firm comes out with a new program that shows a reduction of price or which apparently offers much more for the same price there at once occurs the thought that the quality may have been cut to make this possible. Sometimes this has happened, but far more often, as in the present case of the Buick schedule, the greater value for money is rendered possible by the elimination of redundancy of parts and by better processes of manufacture.

For instance, the new Buick six with its little 3.25 by 5-inch motor has block cast cylinders that can be made more cheaply than the pair castings now that the necessary machinery has been installed, and cutting out the four-cylinder enables the whole attention of the entire force to be turned upon sixes, so establishing an efficiency-producing unity of purpose.

The rigid bodywork, the first class leather upholstery, the highly finished fittings and the good chassis materials which have hitherto given the Buick character are just as obvious in the 1916 cars as ever before.

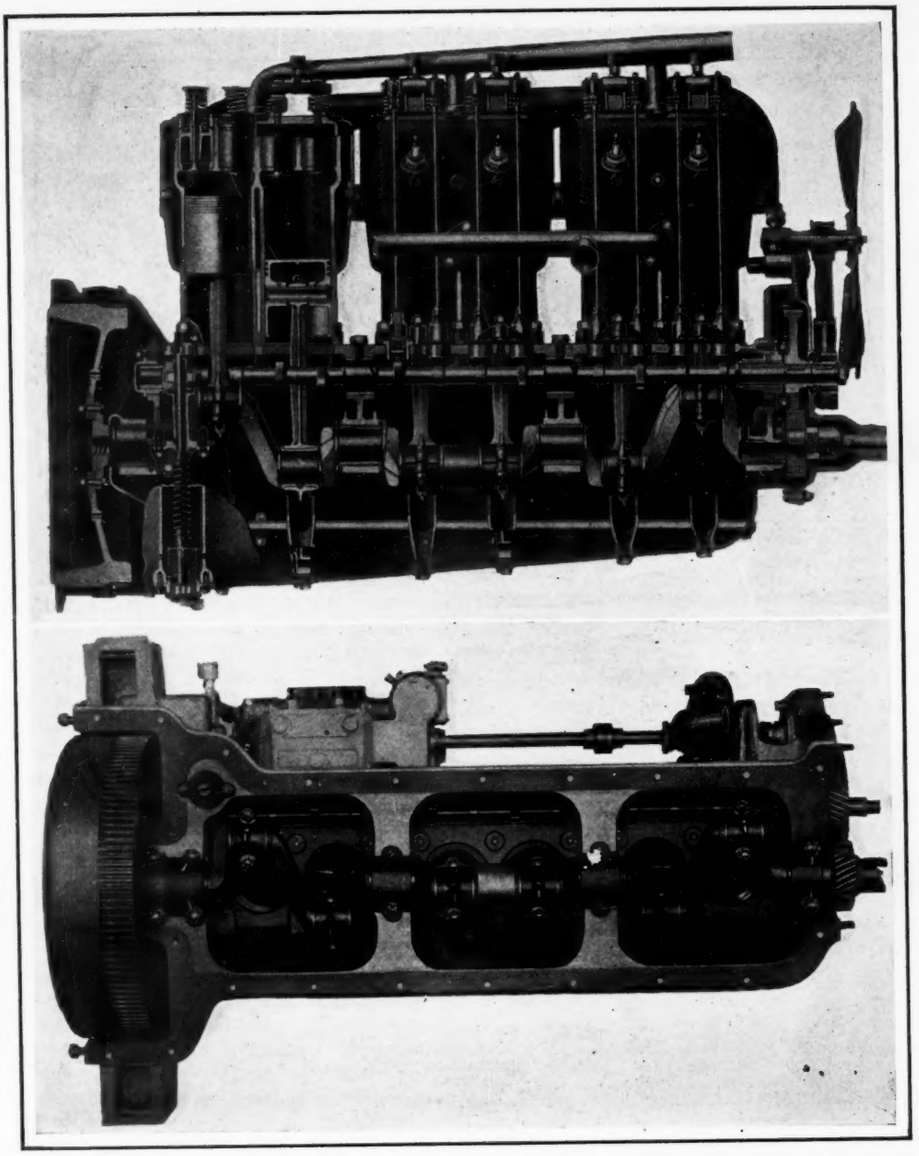
Two Motors Similar

To the casual glance there is a good deal of difference between the small six 3.25 by 5 and the larger motor 3.75 by 5 but a closer look will disclose that the principal thing which accounts for the altered appearance is the use of a block casting for the cylinders of the smaller chassis and pair cast cylinders for the big one. Really the block casting of the small motor is three pairs joined together, as both motors have crankshafts with four bearings and a point which should be appreciated is the way in which the lower caps of the two middle bearings are held up by bolts which pass up through the aluminum of the crankcase and have the heads outside. In the cylinder casting there are holes to clear these heads so removing the cylinders does not disturb the bearings while the support given to the latter is much greater than is readily obtainable from studs. To further enhance the rigidity of the crankshaft support the bearings, which are die cast, have bronze backings or shells though plain die castings are employed for the lower end connecting-rod bearings. A new feature is the use of bronze bushings in the pistons so as to increase the useful life of the wristpins and the pistons themselves, and the latter have been reduced in weight somewhat. A stepped type of cast iron piston ring is used.

The Buick company has, of course, always been a protagonist of the overhead valve system, which it carries out simply and efficiently. The valves are not very large, but the small size is offset to a considerable extent by the directness of the route for gas which they afford; and by the absence of any complicated cored passages in the cylinder cast-

ing. Cams are flat sided and quick lift is obtained by using an extra large roller. Since the valves are held in detachable cages their proper grinding and inspection is rendered ideally easy, and the proper cooling of the cages is guaranteed by the large body of water carried in the jacket space surrounding them. The whole success or otherwise of an overhead valve motor can be traced to proper precaution for keeping the valves cool, a point which the Buick engineers discovered a long while ago.

Since the push rod adjustment is at the upper end of the rod, it also is very accessible, and it is even possible to set the adjustment while the motor is running although this procedure is not advised owing to the possible risk of setting an adjustment too tight, so preventing the proper closing of the valve.



Upper—Section through large Buick six showing the lubrication system, the spring drive for the oil pump and the setting of the valves in the cylinder head. The small six is precisely similar except for the block cylinder casting.

Lower—Four-bearing crankshafts are used on both the large and small Buick sixes. This view, taken from below, shows the water pump and the Delco outfit

Simple Lubrication System

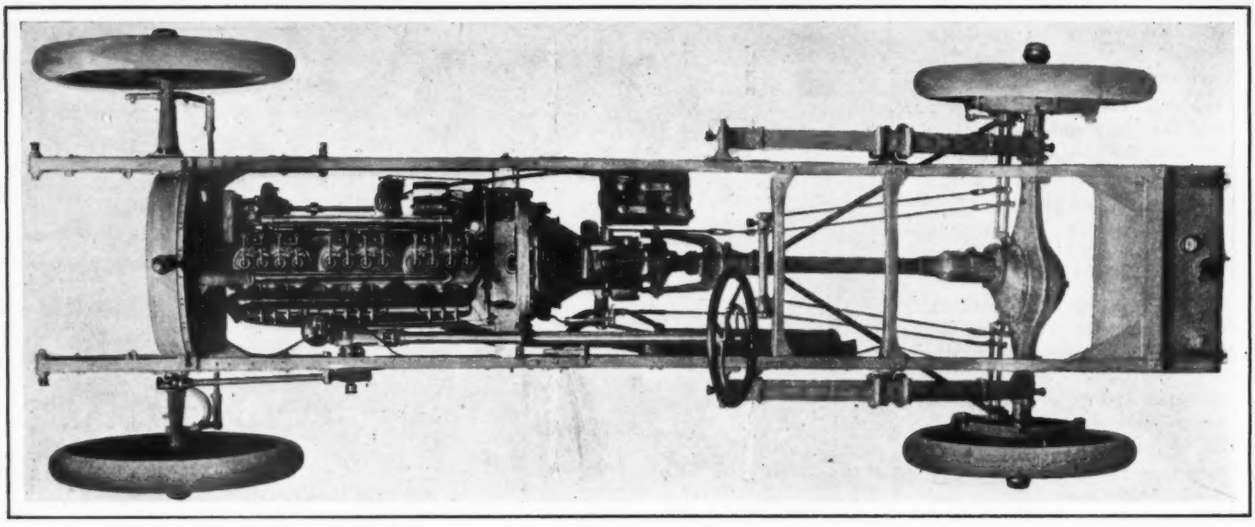
There is no pressure on any part of the oil feed save that necessary to drive the lubricant from the crankcase, up a sight glass on the cowlboard and then down to a branched internal pipe which looks after the distribution to the troughs into which the connecting-rod scoops dip. This internal pipe has six holes drilled in it and it is through these that the oil reaches the troughs. Since the supply from the pump is at one end of the pipe, it has been found worth while to drill these six little holes of different diameters, that furthest from the source of supply being the largest. This is said to ensure a perfectly even supply to each trough. To serve as connection between the gear at the rear end of the camshaft and the pump spindle a coil spring is used, this forming the drive shaft. The idea has been used a good deal, but hardly so much, perhaps, as it deserves, since it is the simplest imaginable way of allowing for a little disalignment and yet preventing any noise such as may be created by almost any sort of universal coupling.

Single-Unit Electricity

For starting and lighting the system used is the latest design of Delco single unit apparatus. In principle this follows the same system of third brush regulation which has been used previously, but a slight internal change enables the full lamp load to be taken at a lower motor speed, so that the battery is idle at any speed above 12 miles an hour. To the switch rack, which has been simplified a little, a small ammeter has been added to show the driver whether his battery is charging or discharging, and this is a distinctly comforting accessory to any man who understands his car. It is easy to argue that if the apparatus is not behaving as it should the motorist can seldom do anything to it, but this is a trite argument when it is remembered that any unusual behavior on the part of the ammeter may show a trouble much more quickly than anything else and may save a more serious derangement. There is a double reduction gear used in conjunction with the Delco apparatus, so that the machine runs much faster when in use as a motor than it does when in action as a dynamo. Ignition is combined with the same Delco machine and has the new pattern of simplified automatic advance.

Ingenious Motor Details

There is a variety of detail work about the motor which indicates the experienced hand and mind. For instance, the lubrication of the timing gears is quite separate from that of the motor proper so that a thicker oil may be used and the steel and cast iron gears kept quiet. A felt gland is used to prevent admixture of the oils and there is a filling plug for the timing gear case at such a level that it is not

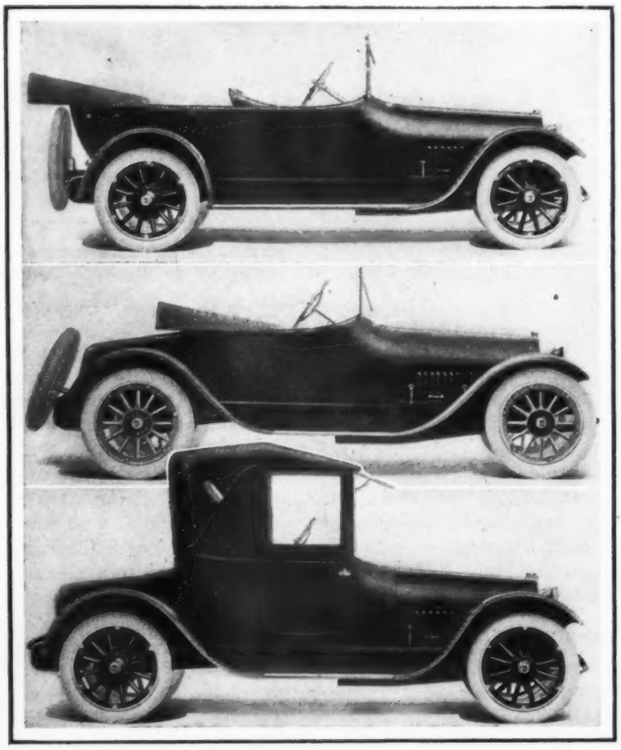


Chassis of Buick big six showing the cantilever rear suspension. The small six is similar except for the motor

possible to overfill the gear very much. Then again there is a small ring oiler that looks after the pump spindle and this has a small separate reservoir accessible through a plug on the right side of the motor.

New Clutch Aids Gear Shifting

The clutch used on both the large and small six is an entirely new design with a very light aluminum center cone and three small springs arranged in a circle instead of the usual heavy single spring, this facilitating adjustment. The old clutch coupling which was a little liable to rattle has been abolished and the clutch shaft is now a single piece of steel integral with the constant mesh pinion of the gearset and located at the front end in a flywheel spigot. Here there is a small bronze bush filled with the patented self-lubricating compound, which renders any other sort of oiling or greasing needless.



Three of the 1916 Buick six models, mounted on the smaller chassis. Top—Five-passenger touring car listing at $985. Middle—Roadster, $950. Bottom—$1,350 coupé. The wheelbase of this chassis is 115 inches and tires are 32 by 4

The cone slides on splines on the clutch shaft, it being bolted to a steel sleeve containing two large ball thrust bearings. Against the rearmost of these the withdrawal fork presses, and the front bearing carries the spider through the medium of which the spring pressure is transferred to the cone. It should be noticed that these ball thrusts have spherically faced rings that allow the spider to take up a slightly angular position in the event of the springs being adjusted unevenly, and this equalizes the pressure all over the cone. When the clutch pedal is depressed to the fullest extent possible the small cone brake seen just in front of the gear pinion is brought into action and quickly stops clutch spinning; thus the lightness of the cone and the brake effect in addition make the art of changing up extremely simple. For changing down the lightness of the cone allows a very quick shift, which is a great advantage, for the second speed is so seldom needed that few drivers have a great deal of opportunity for learning the easiest method if there be any sort of kink. With a light revolving member the lever can be just pulled through without risk of damage to the gears.

Improved Type of Carbureter

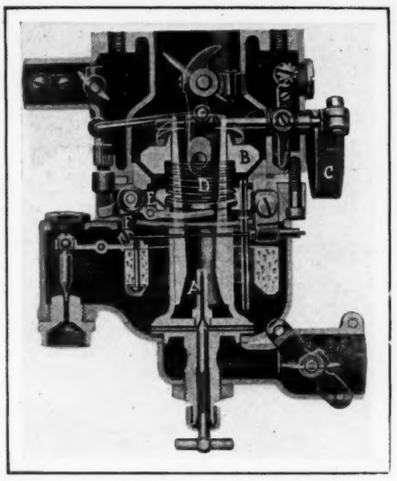
This year an improved model of Marvel carbureter is used in conjunction with an aluminum manifold branched so as to insure an even supply to each cylinder. Immediately above the carbureter is a fairly large gas chamber as shown in the side view of the complete motor. The middle of this chamber is filled by a diamond-shaped block of aluminum so that no gas can go directly from the carbureter to the outlet above it, but is forced to divide into two streams and to pass round the obstruction. This directs the streams toward the extreme ends of the manifold which might otherwise not be filled so well as the middle portion and it is said that the effect upon the running of the motor is most marked.

The action of the carbureter is as follows: There is but one jet, shown at A, and this is adjustable by an internal needle. Thus the air for idling all passes up the venturi tube around this main jet. To control the admission of additional air there is the large cone valve B which is held down against its seat, so closing the orifices, by the weight C on the end of a short lever. This is said to be better than a spring because it cannot vary in strength.

Suction raises the cone and lifts the weight the amount of

air admitted being in proportion to the height the cone is lifted. Now, there is a light spring D which tries to lift the air cone against the weight—in effect it reduces the mass of the weight—and this spring is backed by a collar supported by the forked lever E. This is attached to the lever F and thence to a wire control that ends in a knob on the cowl board. There is a stop screw limiting the return travel of this lever.

Now, if the lever is set so that there is a minimum of spring pressure it will need a maximum of suction to raise the valve and a rich mixture is obtained while putting more spring pressure on enables the valve to rise more readily. Finally, when the knob is operated to its outer limit of travel the spring overcomes the weight and keeps the cone off its seat, thus giving a passage large enough to let in practically pure air for coasting down a long grade. The total effect is to provide a means for altering mixture strength that is available for any changes of weather or altitude without the need for opening the hood.



Section through the Improved Marvel carbureter used on the 1916 Buicks

Gears Are Interlocked

The gearset which completes the power plant is a simple sort of transmission with the main shaft on New Departure double row bearings and the countershaft on bronze bushings. It may be observed that a square shaft is used and, since this is often considered as inferior to splines, the maker explains that the square is used on account of the ease of grinding it quite true. A special machine grinds out the square holes inside the sliding gears, so insuring their accuracy of fit on the shaft, preventing any lost motion which might cause rattle, a good engineering point.

In the lever assembly there are two plungers that move toward the center by reason of springs behind them and, when the lever is in the neutral position these plungers enter and lock absolutely, the gear shifting arms. If the lever is pulled over to bring its lower end into mesh with one or other of the shifting arms, it has first to push back the spring plunger, and the striker can be moved only when the end of the lever has completely expelled the locking pin. This, however, leaves the other shifting arm securely locked by the second plunger, so it is impossible to confuse the gears by careless lever handling.

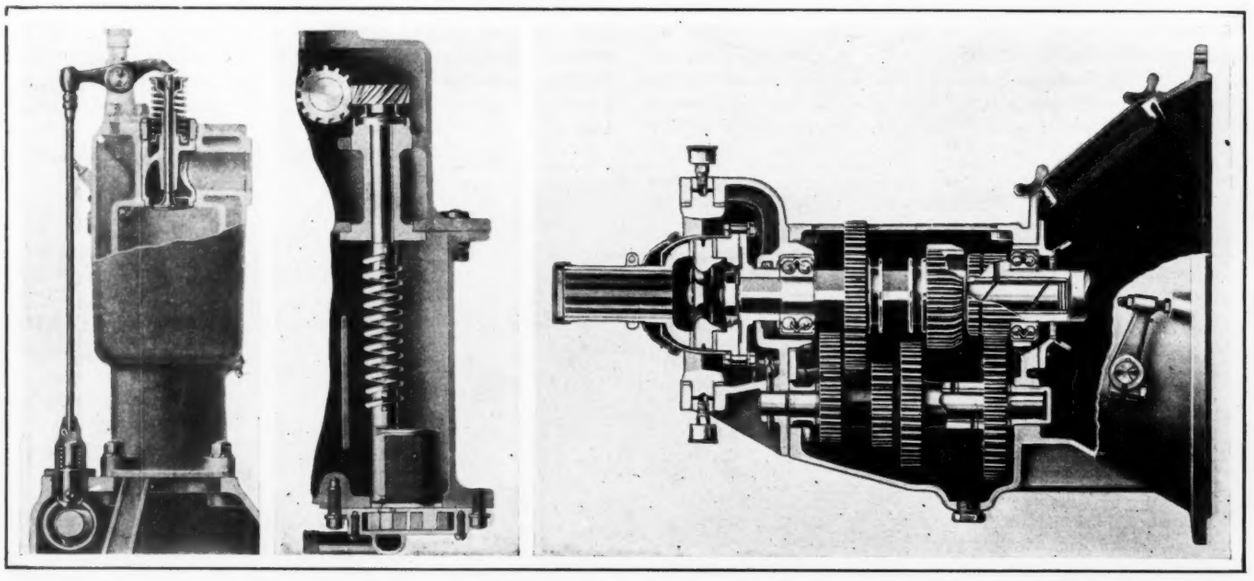
Though it is not new the Buick method for supporting the front end of the torque stay is worthy of study since it is the same in effect as a ball and socket, but much simpler and cheaper to make. The torque tube is forked like many others, but instead of linking the fork end to solid pins on the chassis, it is attached to a ring that swivels upon vertical pivots. This gives a perfect universality of movement to the torque tube and so to the axle to which it is attached.

Tried out on one model last season, the new Buicks have both cantilever rear suspension, the springs being diamond-pointed and of good length.

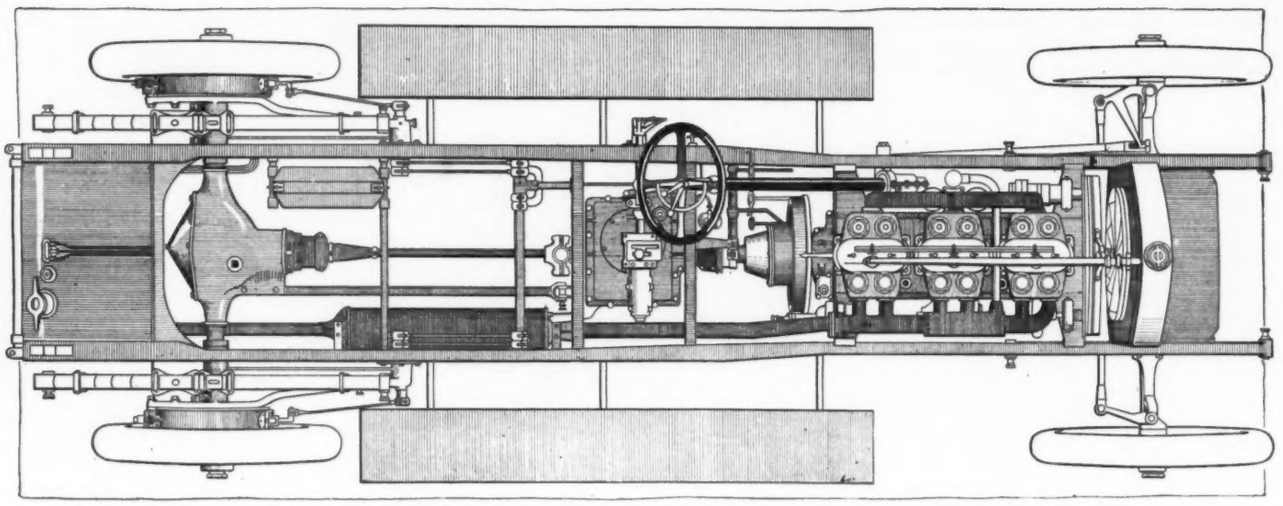
As mentioned at the commencement, there are roadster, touring five-seater, sedan and coupé bodies supplied for the smoll chassis, the prices being $950, $985, $1,875 and $1,350, respectively. For the large chassis the roadster and seven-seated touring bodies only are made, the prices being $1,450 and $1,485. The equipment includes everything from one-man mohair top and ventilating windshield to the smallest spanner necessary. Tires are 32 by 4 inch on the small car and 36 by 4 1-2 inch on the large. A spare rim goes with each car, this being held on a patented rear support which holds the rim from the inside on a sort of false bonding rim.

Battery Capacity Increased

There are no side lamps, but the headlamps contain small bulbs as well as large and so give two intensities of light at will. The capacity, but not the size, of the battery has been increased, so that the current available for town work is increased. It may be mentioned, in conclusion, that the roadster body on the small chassis is wide enough to hold the spare rim and tire inside the tail which adds greatly to the smart appearance of the car. Wheelbases are 115 and 130 inches for the two chassis, and the treads 56 inches, though a 60-inch tread can be had if desired on either car.



Left—Detail view of valve operating mechanism of Buick six. Center—Oil pump, with spring drive, and oil screen. Right—Buick gearset and universal and detail of interlocking device which absolutely prevents the simultaneous engagement of two gears



Plan view of chassis showing location of the control and driving members and arrangement of frame construction

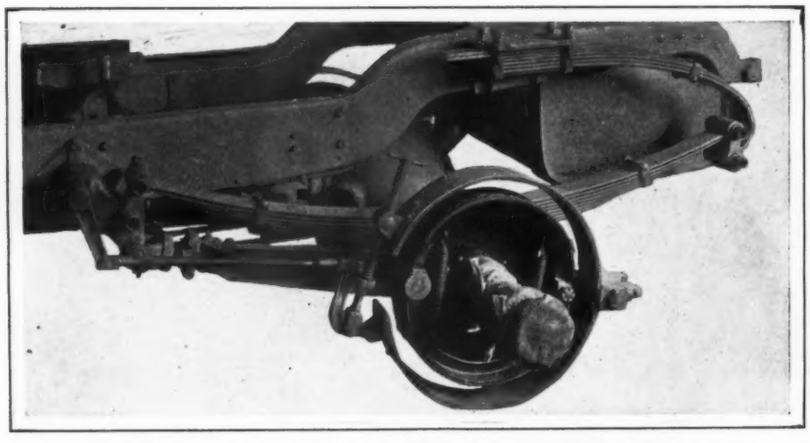
Locomobile Refines Both Sixes

Bodies 3 Inches Lower and Clutch of Unique Multiple-Disk Design—Refinements Make for Luxury and Silence

FOR 1916 the Locomobile models are quieter, easier riding and lower than their predecessors. In addition many small detail changes go to make these new products the most luxurious yet turned out by the Bridgeport factory.

Quietness has been a feature of the Locomobile chassis for some time, but a step further in the direction of absolute silence has been made by the inclosing of the valve mechanism in metal housings, in the refinement of the timing gears at the front of the motor and the driving gears at the rear of the car. In addition to these, rattle is guarded against by the use of pressed steel, one-piece fenders of great strength which keep their shape and which cannot rattle after wear. Throughout the entire chassis anti-rattling protection has been given maximum attention.

Easy riding has been secured in the new model by the use of an entirely new clutch which gives softer engagement, the use of improved 10-inch upholstery and softer cushion springs designed and patented by the Locomobile company. The thickness of the upholstery on the extra seats has been increased by 1 1-2 inches, and this, in connection with the new springs and an improved flatter spring suspension for the vehicle itself, combine to work an important improvement in the ease of suspension.



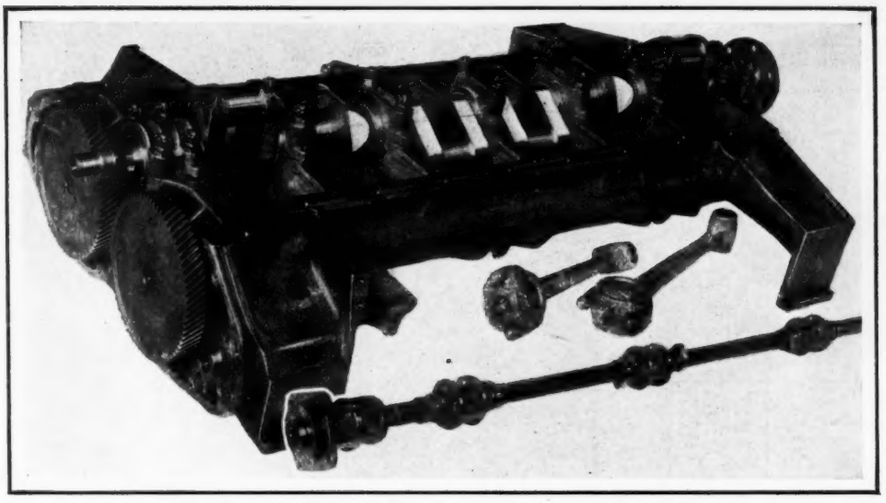
Double-drum brakes on 1916 Locomobiles with space between for cooling

Bodies 3 Inches Lower

The body has been lowered 3 inches and the running boards 1 1-4 inches. In addition, the wheelbases have been increased in the two sixes which make up the line for this season and which are in fact, refined continuations of the 1915 models. The two sixes are known as the 38 and 48 and the increases of wheelbase have been 8 inches for the smaller model and 3 inches for the larger, making their lengths respectively 140 and 143 inches. This lengthening and lowering at the same time has produced a car which has a distinctive appearance and readily marks the new design. Other changes in the appearance are noted in the motor bonnet which now has no louvres but plain panels, an increased slope and a softened cowl line. The running boards are low and wide and are free from all incumbrances. The doors are wider and while the body itself is 3 inches lower along the sides than in the 1915 model, the distance from the top of the body to the top of the cushion remains practically unaltered, thereby allowing the passengers to sit lower than in last season's model.

Improvements have been made in the fittings and equipment, the dash instruments being rearranged to allow foot operation of many of the switches, a step light has been fitted which is lit automatically when the door is opened, illuminating the step and the ground near it and

a tonneau light which may be adjusted to throw the light either upward or downward is also part of the standard equipment. Improved material is used for the top which is a one-man design, but instead of having the side curtains fold up into the top itself they now fold into the back of the front seat. The top is covered with Pantasote. Another new feature is the combination speedometer, odometer and clock sunk flush into the center of the dash and so arranged as to make the reading of these instruments easy at night by an electric lamp.



Seven-bearing crankshaft and the chrome-nickel steel, forged camshaft

Difference in Dimensions

Both Locomobiles 38 and 48 are similar in design and differ only in dimensions. The motors are T-head, the 38 being a 4.25 by 5 and the 48 a 4.5 by 5.5. According to the horsepower curve furnished by the factory, and illustrated herewith, the maximum horsepower developed by the 38 is 65.5 and by the 48 is 82.5. The S. A. E. rating of these motors are respectively 43.4 and 48.6. The cylinders are cast in pairs with the tungsten valves carried on opposite sides. A feature of the cylinder manufacture is to have the compression space in each cylinder the same, and all are calibrated to have this space 26 per cent. of the total volume of the cylinder when the piston is at the bottom of its stroke. The pistons are gray iron castings ground to size and fitted with four compression rings at the top with an extra oil ring at the bottom. The wristpins are case-hardened alloy-steel ground to a finish and are a drive fit into the piston bosses. The bearing is contained in the upper end of the connecting-rod, being a bronze bushing and the pins are held by two studs.

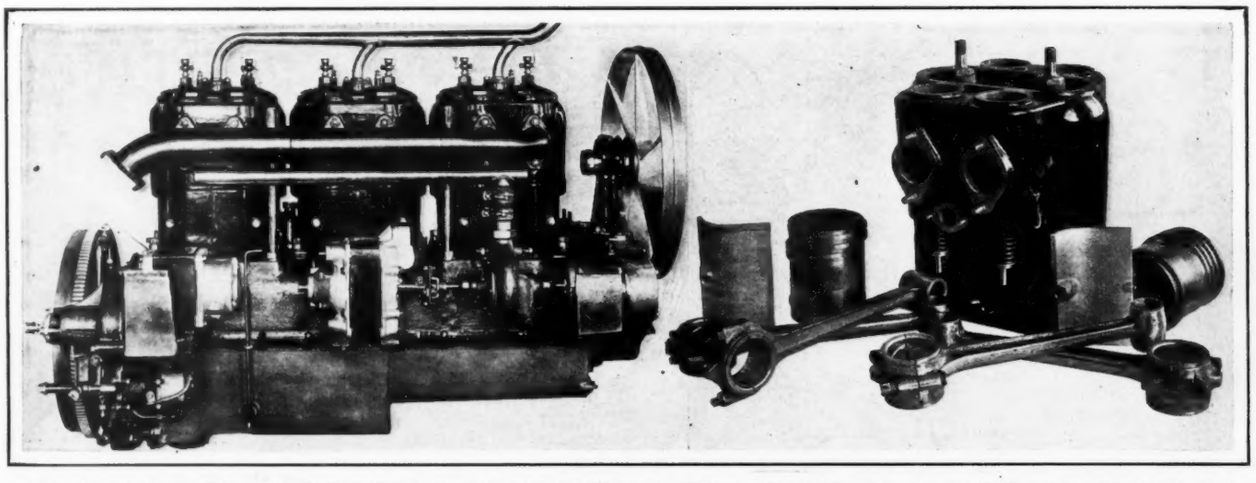
The connecting-rods are drop-forgings of chrome-nickel steel and carry at the lower extremity bearings which are made up of bronze boxes lined with babbitt-metal. Adjustment can be made on these bearings by removing steel shims beneath the upper and lower halves of the bearing boxes.

Nickel-steel is used for the crankshaft which is carried upon seven main bearings used by the Locomobile engineers for the purpose of eliminating any chance of a whipping action. Particular attention has been paid to the balancing of the entire crankshaft, connecting-rod and piston assembly, the crankshaft being given a running balance while the reciprocating and oscillating parts have been balanced in the original design of the motor and in manufacture by selecting the pistons and connecting-rods in sets of six, all weighing the same and in the case of the connecting-rods, each having its center of mass in the same location. The weight limit of all the reciprocating parts has not been cut down to the lowest possible point, but has been designed with a view to provide an ample factor of safety under the stresses of heavy duty work such as hard pulling with a wide open throttle.

Crankshaft Bearings Accessible

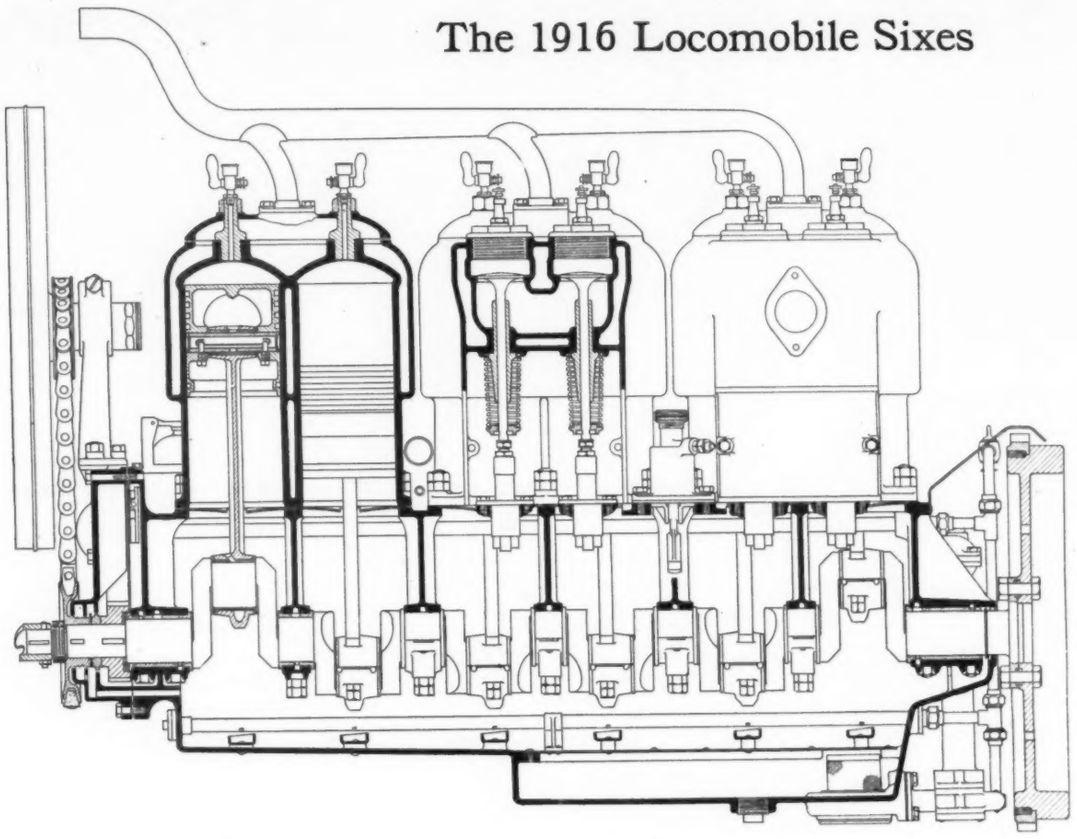
The bearings for the crankshaft are hand-scraped, and are carried in the upper part of the crankcase being accessible by dropping the lower part of the crankcase. The crankcase itself is manufactured in two parts, the upper part of government bronze testing 80,000 pounds to the square inch tensile, and the lower half of cast aluminum. The four arms for the motor support are a part of the bronze casting forming the upper half of the crankcase.

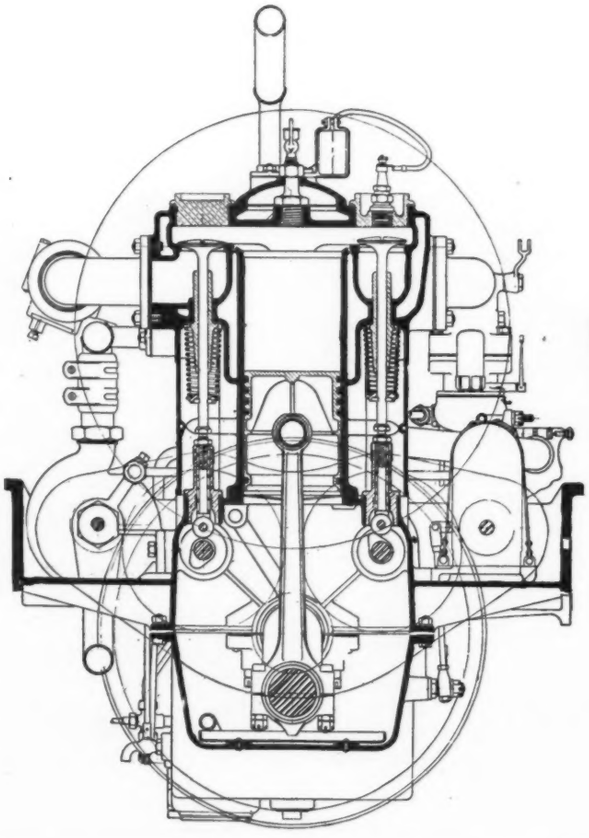
Camshafts are chrome-nickel steel forgings with the cams integral with the shaft. The exhaust camshaft is 1 1-16 inches in diameter and the intake camshaft is 7-8 inch. They are supported by five bronze bearings. The cams are hardened by a process which renders the surface glass hard and the inner structure of the cam of sufficient toughness to withstand the thrusts of valve drive. The camshaft gears are

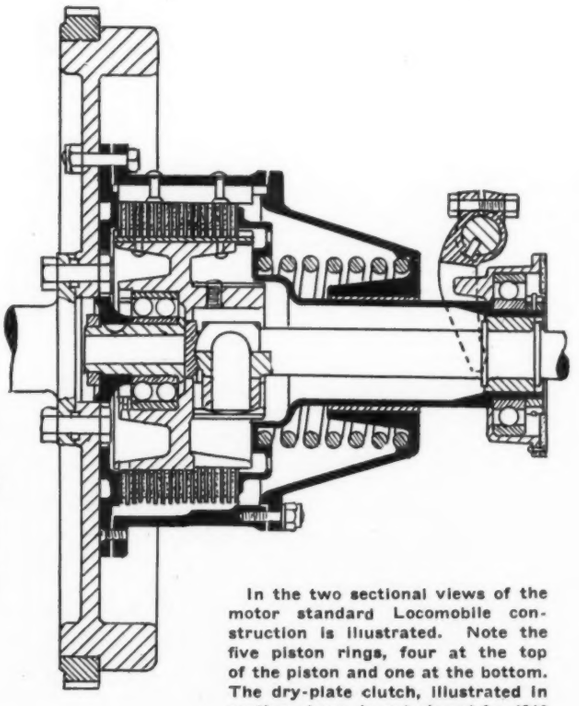


Side view of the motor and disassembled view of cylinder casting and pistons, connecting-rods, etc. Note the new valve cover plate

The 1916 Locomobile Sixes

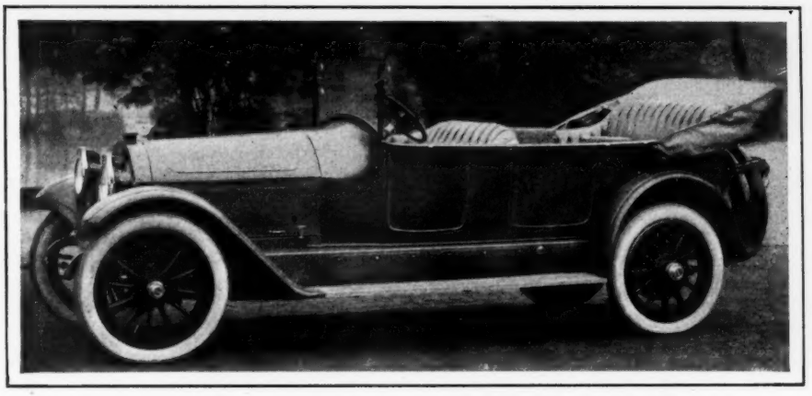






In the two sectional views of the motor standard Locomobile construction is illustrated. Note the five piston rings, four at the top of the piston and one at the bottom. The dry-plate clutch, illustrated in section above, is redesigned for 1916 and employs sixteen fabric disks in conjunction with nine driving and eight driven disks of saw steel

cut helically and are driven by an alloy steel pinion on the crankshaft. The water pump shaft and magneto shaft chrome-nickel steel gears are driven off the camshaft gears. The tungsten valves are ground to a true seat at the factory and with this material should not warp or pit under any usage. The tappets are also of alloy-steel and operate in bronze guides while the rollers are case-hardened and operate on hardened pins. The proper clearance between the tappet end and valve-stem is .008 inch on the exhaust side and .004 inch on the ignition side. The entire mechanism including tappets, stems and springs are inclosed in aluminum housings for protection against mud and sand and also to minimize noise.

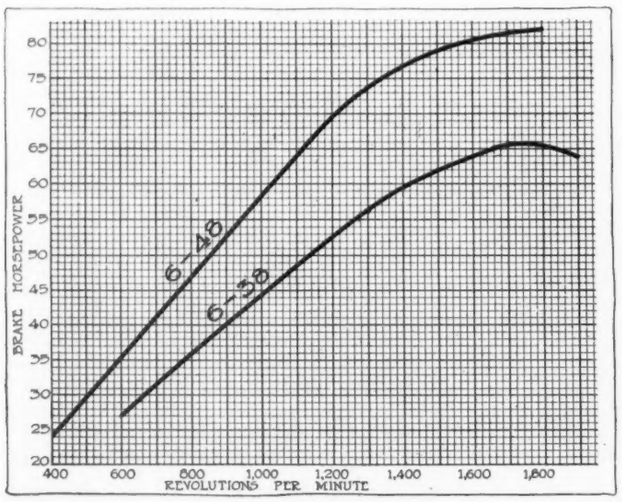


Seven-passenger touring body fitted on 1916 Locomobile chassis

Lubrication is by a combined low-pressure feed and splash. All the oil along with the pump splash troughs and sumps is contained in the aluminum oil pan at the bottom of the crankcase. On the 48, 7 quarts of oil fill the reservoir and on the 38, 6 quarts. The pump is a gear design operating at a lower level than the sump and hence is self-primed. At the intake of the pump there is a strainer through which all the oil is drawn and forced into a series of leads, one of which passes along the bottom of the crankcase and supplies the six troughs for splash lubrication and another which passes along the upper half of the crankcase, from which branches are led to each of the main bearings. This same main lead also carries oil to the magneto and pump shaft bearings. The connecting-rod scoops dip .125 inch into the troughs, throwing a spray of oil over the entire interior of the motor and all the surplus oil drains back to the oil sump. The pressure on the oiling system can be controlled by regulating a by-pass valve and baffle plates prevent the motor from becoming flooded when descending a steep grade.

Air pressure feed is used on the gasoline. The tank holds 30 gallons and is hung from the rear of the chassis frame, being made of galvanized sheet steel and fitted with a calibrated gauge denoting the amount of fuel in the tank. The tank is sealed by a heavy forged filler cap with a leather gasket to prevent air leaks. Air pressure is obtained by a reciprocating pump driven by an eccentric on the camshaft. It is a single acting design and is lubricated from the crankcase. An adjustable regulator is set on the air line to hold the pressure in the tank to 2 pounds.

Locomobile continues to be one of the few companies which manufactures its own carbureter. Briefly, this is an eccentric float design with an automatic air valve, the latter having three springs in series for low, intermediate and high-speed air. In the center of the intake passage is a venturi with a needle valve. The gasoline passes to the atomizer nozzle which is a double-jet design, the low-speed holes being drilled at the throat of the venturi and the high speed at the top of the nozzle which is located some distance above the venturi. The main air enters the base of the carbureter and is supplemented by the auxiliary which enters the secondary valve controlled by the calibrated springs. The mixture may be made richer or leaner by changing the position of a lever which adjusts the tension on the springs. The throttle is a butterfly type and hot-air facilities are provided.



Horsepower curves of the two Locomobile sixes for 1916. They are known as the 6-38 and 6-48

Special Westinghouse Electric System

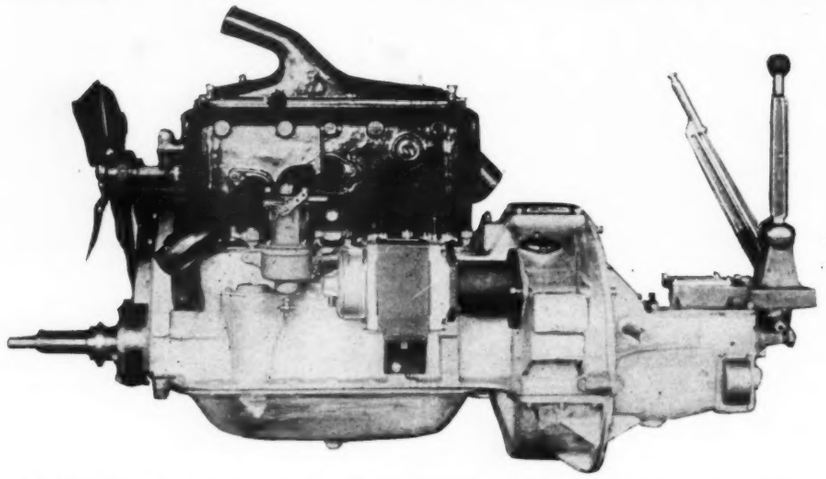
The electric equipment of the cars consists of a Westinghouse electric lighting and starting system and a Bosch high-tension dual ignition system. The Westinghouse installation is a special design for Locomobile cars, so arranged as to provide push-button starting and automatic control. The regulation of the generator is accomplished by a differential winding of the field which provides a constant output curve as shown in the accompanying illustration. A feature of the generator material is that when the generator becomes warm, the output is tapered down so that in summer, when the high charging rate is not needed, the output is lower than in winter when it is required. The wiring is on a single system, the return being grounded. The exterior winding is carried in flexible metal conduits.

The starting motor is engaged by a solenoid series coil which brings the pinion into mesh with the teeth on the flywheel and is held in position and mesh by a shunt coil. When the series coil becomes energized it pulls a soft iron core into the magnet winding, thus shifting the starting gear into mesh with the flywheel. Just before the gear meshes, a small amount of current is allowed to flow through a resistance in the switch, causing the starting motor to spin slowly to facilitate the mesh of the gear and when final contact is made the hold-in or shunt coil comes into action and the full starting current cranks the motor. When the engine commences to fire the voltage of the generator builds up and the cutout switch closes. This grounds the positive side of the generator and opens the relay switch, allowing the pinion to become disengaged by means of a powerful spring. Two new features are involved in this device, one being a brake which brings the starting motor gears to rest quickly and thereby eliminates any chance of a clash in case of a too-hurried re-engagement and another is the forged steel rim on the flywheel for the starting gear. This is driven on as a very tight fit and held in place by headless set screws. Some of the main facts regarding the starting motor are that it is

(*Continued on page* 1084)

Imperial Four Has Large Motor

Good Chassis Detail and Very Large Five-Passenger Body Characterize New Model for 1916—Hotchkiss Drive Through Long Underslung Rear Springs



Intake side of 3 3-4 by 5-inch Continental power plant used in Imperial four for 1916. Note mounting of Westinghouse starter unit

ON first seeing the 1916 Imperial made by Mutual Motors Co., Jackson, Mich., the immediate impression is that the car is very large for the price—$995. Closer examination of the chassis also shows that size is not the only thing about the car by any means for the main components are good and the detail work in keeping with the character of the essentials. The motor is a four-cylinder Continental 3 3-4 by 5, piston displacement 221 cubic inches, and, since the only cast iron part is the cylinder block, the engine should be light for its power. It is stated by the manufacturers that the weight of the complete car is 2,450 pounds and, on the road, it is easy to feel that the power-to-weight ratio is large. The high gear ability is quite exceptional for a four-cylinder car and the flywheel has sufficient mass to prevent any unpleasant pounding when the motor is running at a very low speed indeed.

In construction the motor follows usual Continental practice the lubrication being constant-level splash combined with pump, the valves inclosed and provided with cylinder head plugs so that they are accessible without removing more than one valve at a time. A very large crankshaft is used with the idea of eliminating vibration and there are three main bearings of ample proportions. Though the conditions of our road trial on this car did not make possible any high speed we were able to observe that there is practically no vibration at any pace up to 35 miles an hour and the engine did not then suggest by sound or otherwise that it was revolving at a great rate. It is geared 4 to 1 in the rear axle and the tires are 33 by 4.

Westinghouse Electrical Equipment

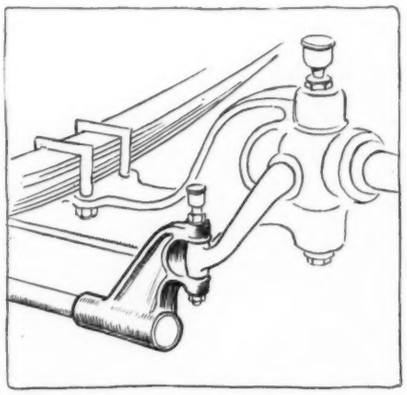
The electrical outfit is Westinghouse, with a unit generator and ignition and a separate starting motor, the latter meshing with the flywheel through the medium of a Bendix drive. The generator is driven by a shaft on the right side and there is a substantial leather coupling while, as is shown in the illustration, the ignition part of the machine is set vertically, containing an automatic advancing governor. All details of the distributor are magneto type. The valves are all extremely accessible as the generator platform is placed low enough to prevent the generator obscuring the tappets when the valve cover plates are removed.

Located on the opposite side to the valves is the Stromberg carbureter, this having a short intake pipe only, as the manifolding is carried out within the cylinder casting. Right alongside the carbureter comes the oil filling cap in a place where lubricant can be poured in without difficulty, and a gauge is used to register the amount of oil in the motor. There is no oil indicator on the cowl board.

Disk Clutch Has Easy Action

The inclosed disk clutch has alternate Raybestos faced and steel plates and is proportioned to the torque to be transmitted so that the pedal action is not so heavy as usual. It is, in fact, a very easy clutch to operate. Similarly the gear shift is smooth and free so that it is easy to control the gears quietly and quickly. The gearset is a Muncie and provides three speeds, but a point is that annular ball bearings of the best quality are employed in it.

Very long underhung rear springs are used, designed especially to give a Hotchkiss drive, so the propeller shaft is fitted with two universals. The speedometer drive being taken by gearing off the forward end joint casing. Sometimes vibrations in the drive arise from the practice of taking the drive through the springs, and to guard against the possibility of such a happening the Imperial rear springs have a particularly wide bracket for the attachment of the front ends of the springs to the frame. This, like other frame fittings, is hot riveted in position. The two spring hangers are employed as plummer blocks for the brake shafts which cross the frame at this point.



Detail of unusual tie rod construction used in Imperial four

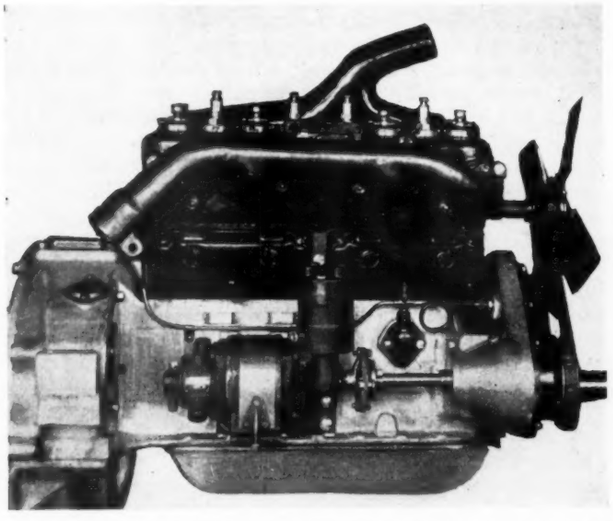
Ball-Bearing Axle

The rear axle is a Salisbury with straight-tooth bevel gearing and for the support of the pinion and the differential large ball bearings are used.

The axle sleeves are carried through, inside the road wheel hubs so that the weight is borne directly by a pair of Hyatt, heavy-duty roller bearings located in the plane of the wheel and the drive shaft secures the wheel in place. The upper half of the center case of the axle is detachable for inspection of the bevel drive or differential it being pointed out that this way of splitting an axle case leaves the lower portion a solid oil container that cannot leak lubricant by reason of failure properly to tighten a few bolts.

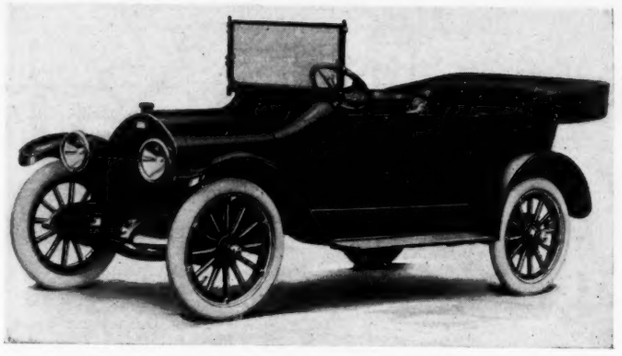
Front springs and steering gear layout is normal, but executed with an eye to the accessibility of the grease cups which is everywhere excellent. A detail of the steering gear which though not unique is worthy of special mention is the way in which the tie rod is lowered to clear the underside of the motor without putting a bend in the tube. A bent tube is less easy to set to a definite length and is more liable to distort than a straight one, so the Imperial uses a straight tube and drops it by means of forged hangers at each end. These small drop forgings are extremely strong and rigid and are also neat in appearance. The chassis frame is of heavy gauge steel, designed for rigidity so as to eliminate body squeaks and further to guard against noises of this character the running board aprons have a felt packing strip both beneath them, against the frame, and above them against the body.

In assembling the fenders and the aprons a large number of bolts is used to secure rigidity and permanent freedom from rattle.



Exhaust side of Continental motor used in Imperial four, showing mounting of lighting and ignition unit and fan belt drive

Imperial rear axle, showing long underslung springs with brackets at the front ends which transmit the drive to the frame. The fitting of the road wheel on a high-duty roller bearing is also a feature



Imperial four-cylinder touring car which sells for $995 with complete equipment

It has become so usual to say that a body is of streamline form and that it is roomy that the phrases are losing their true meaning, but it is impossible to forego the remark that the Imperial body will hold five people of greater individual bulk than the majority of cars having the same passenger rating. As to its lines they suggest space and it is a car to catch the eye, though it might be hard to say quite why this is.

Completing the specificatory details: Wheelbase 115 inches, Detroit rims, a spare rim included in equipment. The headlights have two bulbs for full and diminished illumination, and the switch gear is placed conveniently on the cowl board. In the cowl is the gasoline tank, which has a gauge the driver can read while at the wheel. Good upholstery with deep padding, a leather covered back to the front seat, and a good carpet make for comfort in the rear compartment.

Pathfinder Twelve and Six for 1916

(*Continued from page* 1066)

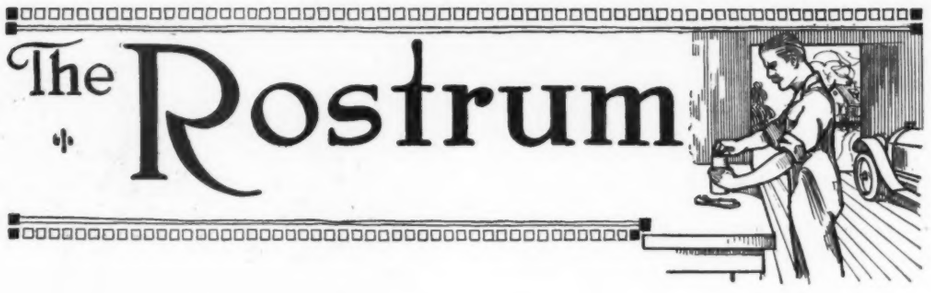
flat when the car is unloaded. These springs are 52 inches long and have leaves 2 1-2 inches wide, the main leaf being of alloy steel and the shackle extra strong to care for the drive. The spring mounting brackets are of bronze and made unusually heavy. The rear spring seat, of course, oscillates, the front end being shackled.

Bushing at Every Bearing Point

There is one feature of Pathfinder design which might be brought out here in conection with the braking system, but which holds true of the whole chassis design. Wherever there is a bearing surface a bushing of some type is used. Brake rocker shafts are bronze bushed, the brake and clutch pedals likewise. The cantilever spring trunnion has a heavy bronze bushing and the steering connections are steel bushed.

In the Pathfinder bodies there is little noticeable change, the low-hanging, characteristic V-shaped radiator, curved fenders, etc., being retained. The battery box, formerly on the left running board, has been removed, leaving both boards clear. The back of the front seat does not extend upwards as much as it did on the former model and the tonneau has been made a bit larger. The two-tire carrier still is in the rear. The three-passenger roadster design also has been improved in detail. Tire sizes for this year are 35 by 4 1-2, straight side, non-skids in the rear. The standard colorings are as follows: Blue-black with white or gray running gear, wine or dark green with the same color of running gear. Other colors are $50 additional for the body and $10 for the running gear.

Body types for the coming year are the same as they were for the past season, there being roadster, four-, five- and seven-passenger touring cars at the same price and inclosed cars on special order.



Has High Mica Commutator Trouble

EDITOR THE AUTOMOBILE:—Have been working on a Wagner one-unit starter and generator on a Studebaker 35 and have it so that it will charge at 7 amperes if I press the contact point on the cut-out at the start. I can slow down the motor so that it will cut out and then speed up and will cut in by itself, but if I stop the motor and start again, it will not cut in without help. I have cleaned both commutators with fine sandpaper, and soldered all connections. What is the cause for it not cutting in when starting the motor after it has been idle for some time?

2—The starter will pull the motor with priming cups open, but is very sluggish with a new battery charged to 12.75 specific gravity and all connections tight.

3—I have been told to groove the insulation between the brass segments on commutator. Is this proper? If so, please give reason. I have seen on a 1915 Overland, equipped with an Auto-Lite starter and generator that the generator commutator had a sort of groove between the segments. I should imagine that dirt and bits of metal would accumulate in these grooves and short circuit the armature coil.

Melvin, Ia. H. EULBERG.

—From the information contained in your letter it would seem that the mica between the commutator bars is a little too high. It is entirely proper that this should be scraped out so as to be below the surface of the commutator. In other words it is necessary that there be grooves between the segments of the commutator, first because of the high speed of instruments of this type, and second, the copper being softer than the mica, which is used as an insulator separating these segments, that should the mica protrude above or through, expanding from contact with oil or dampness, prevent the brushes from making constant contact with the segments, the efficiency will be greatly impaired. It is therefore, advisable to keep the mica slightly below the surface of the commutator and hence the groove between the segments.

Keep Commutators and Brushes Clean

The commutators and brushes of these instruments should be examined at least every week or 10 days to find out their condition. If the commutators are dirty, or the mica protrudes above the surface, the condition can be detected from the action of the generator as follows:

The relay will not close and the generator will not charge even though the engine is speeded up to a very high r.p.m. If, however, the engine is speeded up until it corresponds to a car speed of 15 to 20 miles per hour, and then the contact points of the relay are closed with the finger, the generator will start to charge and the contact will remain closed. If the engine is now slowed down, the contacts will open and they will close properly upon speeding the engine up. However, if the engine is stopped for a few moments, and then started it will be necessary to close the contact points of the relay with the finger before the starter will charge the battery.

In order to eliminate this condition it is necessary to scrape out the mica from between the commutator bars until it is below the surface by about 3-64th inch. No mica should be left above the commutator surface.

Before attempting to remove the mica it is advisable to remove the starter generator from the car and then withdraw the armature. A special jig A can be made for large shops for doing this work or a special tool B as shown in Fig. 1, can be used for small shops or individual repairmen. This tool can be made of a hacksaw blade about 8 inches in length, one end being ground sharp like a parting tool on a lathe or planer to the thickness of the mica between the copper bars. The other end should be shaped like a hook, having the same kind of a point as on the other end. Around the center of this tool should be folded a piece of heavy tin wrapped with electric tape making it easy to handle and less likely to break. The mica is removed by forcing the sharp edges of the tool from the outer edge of the commutator surface to the inner edge. It can be finished with the hooked edge being drawn back in the opposite direction. Do not cut away the copper as this will increase the width of the slots and give very poor results. It will be found convenient to place the armature in a vise while undercutting the mica in this manner. Do not use a sharp needle-pointed tool, as this will not give good results. A tool of this shape will simply make a V-shaped crevice in the mica and the pieces nearer the commutator bars will not be removed. A small magnifying glass can be employed to great advantage in detecting whether or not all the mica has been taken from the grooves to the proper depth. It is of great importance that the tool which does this work be very sharp.

Maxwell Electric System Outlined

Editor THE AUTOMOBILE:—Kindly outline the lighting and starting system used on the Maxwell car. Would appreciate your tracing the current.

Isanti, Minn. A SUBSCRIBER.

—The starting and lighting system used on the 1915 Maxwell is the Gray & Davis two-unit outfit. The apparatus is composed of a dynamo, starting motor, battery, a regulator cut-out for controlling the output of the dynamo, switch for operating the cranking motor and lighting switches, fuses, wiring, etc., to make up the various circuits and protect them against injury.

Briefly, the operation of the system is as follows: When the car is in normal condition the motor is stopped, the battery charged and nothing whatever about the car has any motion. By pressing the starting switch, the potential energy contained in the storage battery is drawn upon and starts to operate the cranking motor by first throwing into engagement the drive pinion P with the flywheel bevel B in Fig. 2, and then by spinning the cranking motor when these two gears are in engagement the motor is started. As soon as the motor starts, the starting pedal is released, disengaging the flywheel pinion and electrically disconnecting the motor from the battery.

As the motor speed increases, the generator or dynamo

which is driven by it produces a current of electricity which passes through the regulator and then on to the storage battery, charging this with electricity which is drawn for the purpose of lighting the lamps or for again cranking the motor. An ammeter on the dash shows the discharge and charging current in amperes. The current can be traced from the accompanying wiring diagram Fig. 3.

Moon Co. Makes Its Own Bodies

Editor THE AUTOMOBILE:—Kindly advise through the Rostrum the name of the maker of the bodies used on the 1915 Moon cars.

Homestead, Pa. H. N. M.

—The Moon Motor Car Co., St. Louis, Mo., makes its own bodies, having a fully equipped plant to do this work.

Tire Diameter Affects Speedometer

Editor THE AUTOMOBILE:—I have changed the 30 by 3 front wheels and tires on my car to 30 by 3 1-2 in order to have the same size all around. How much more than a mile will I have to travel before the speedometer registers 1 mile?

2—Is there any inexpensive way of changing the speedometer to make it accurate? It is a Stewart on a 1915 Ford.

Gladstone, N. J. J. M. HARPER.

—Unless you have replaced the entire wheels you should not have changed your 30 by 3 for 30 by 3 1-2 as the rim profile for a 30 by 3 tire is different from that of a 30 by 3 1-2. In changing your equipment from 30 by 3 to 30 by 3 1-2 on the same wheel it would be necessary to cut the felloe of the wheel 1-2 inch all the way around and buy a new rim of different profile. Without changing either the wheel or the rim you can use a 31 by 3 1-2 tire in which case the distance traveled by the car would be 3.33 per cent. greater than the speedometer reading would show. If you change the wheels and rims and use the 30 by 3 1-2 size in place of the 30 by 3 your speedometer reading would not be affected.

2—The method of changing the speedometer to make it accurate is simply to put a new gear on the speedometer drive. This is not expensive, the cost being $1 for the new gear. It must be remembered that unless you use the 31-inch size it will not be necessary to change.

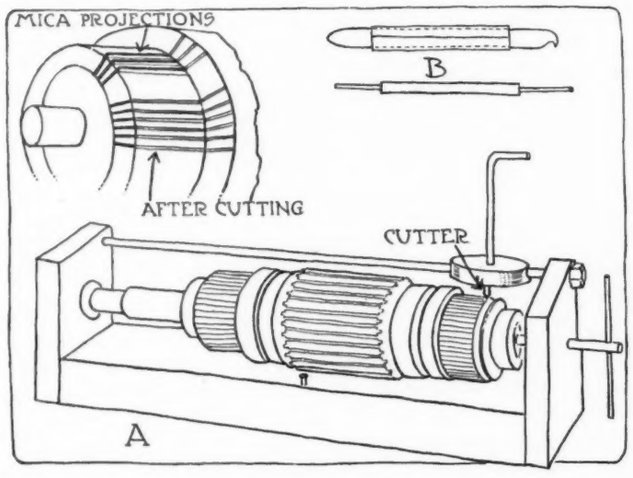
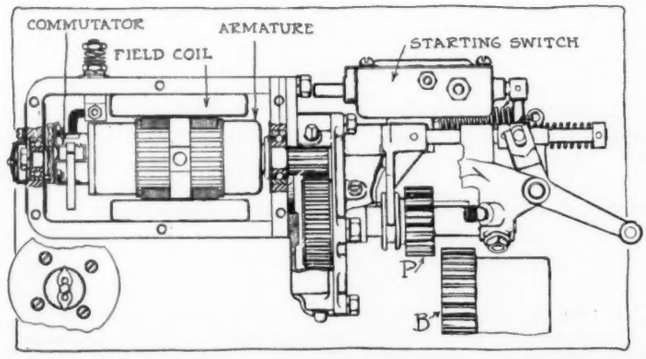


Fig. 1—Special shop jig A and hand tool B for trimming commutator micas and also sketch showing commutator partly trimmed



Fog. 2—Part sectional view, showing operation of Gray & Davis electric starting motor on the 1915 Maxwell. P is the drive pinion and B the teeth on the periphery of the flywheel

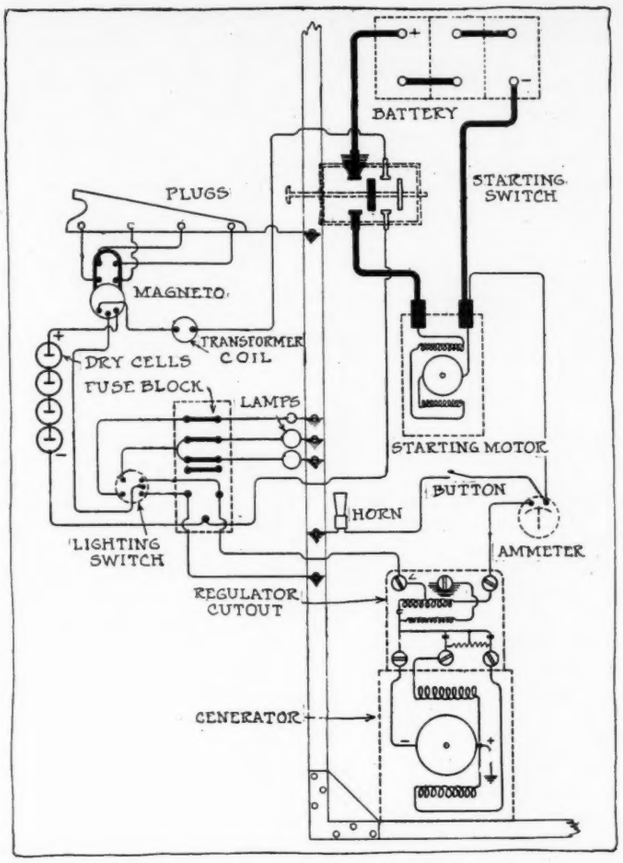


Fig. 3—Wiring diagram of electric system on the 1915 Maxwell

Defective Hose Causes Overheating

Editor THE AUTOMOBILE:—The writer has a 1913 six-cylinder Chalmers car which heats up considerably; in fact on a warm day it gets so hot that it is torture instead of a pleasure to drive the car, and on moderate driving it will boil.

This, in my opinion, is due to the car being driven without any water in the radiator a distance of 6 miles by another party, part of this 6 miles having two very steep hills and 1 mile up a mountain with a maximum grade of 8 per cent. Before this party drove the car without water it worked fine and never heated to any extent. I would like to know whether there is anything that I could do to stop the heating up?

Leckrone, Pa. J. A. R.

—THE AUTOMOBILE has no record of any heating troubles with the Chalmers 18, and in instances where trouble has occurred, it has been brought about through some local condition. As you explained in your letter that the trouble had not developed in your car until the car had been run a considerable time without any water and in running the car in

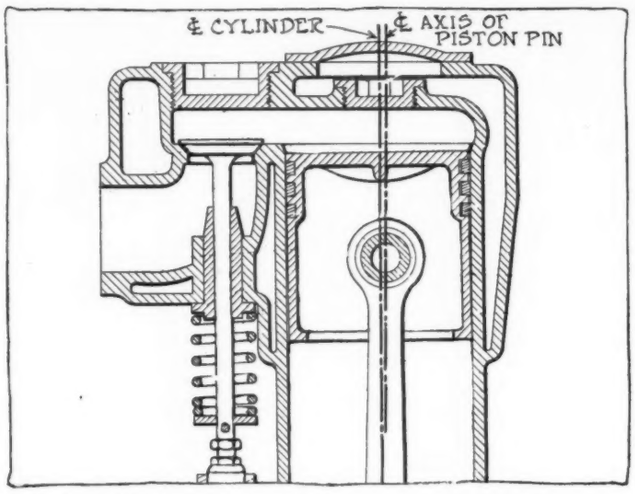


Fig. 4—Section through cylinder of internal-combustion motor illustrating the principle of the Packard patented offset wristpin

this condition, the only trouble that could develop would be to injure the rubber hose connections, radiator to water pump and cylinder block to radiator. In this instance, the motor and parts undoubtedly became so hot that the inside surface of the radiator hose collapsed and this undoubtedly is obstructing the passage of water on this particular car.

It is suggested, therefore, that you remove the radiator hose and examine it and if necessary install new hose, being sure that they are not kinked.

There is also a possibility of the radiator cells having become partially clogged on account of the sediment which was undoubtedly distributed to the cells by the steam generated. This might have clogged the cells. If this is the case the radiator should be filled with water; then draw off about 1 quart and dissolve in this the maximum of concentrated lye which the water will carry. This should be poured into the radiator and the motor run for several moments until the cooling system has become thoroughly heated. The water is then drained off and thoroughly flushed out with several fillings of fresh water, care being taken not to get any of the water in which the lye is dissolved on external parts.

Packard Patented Offset Wristpin

Editor THE AUTOMOBILE:—I would like to see the offset wristpin discussed in your magazine. I understand the Packard company is using this style in the new cars for more quiet. How might this be accomplished?

2—How will it affect speed?

3—How will it affect wear on the cylinder walls?

Providence, R. I. H. C. ORNDORFF.

—The Packard company has been manufacturing motors for some time with the piston pin offset approximately 3-32 inch from dead center in order to allow the use of a fairly free piston to prevent sticking and at the same time get away from the troubles of piston slap. The Packard company, in fact, took out a patent No. 1,138,892 issued to Edward F. Roberts and assigned to the Packard Motor Car Co., covering this construction. In presenting the reasons for this device, the patent application states:

"It is well known in hydrocarbon motors, and particularly in upright, or vertical motors, that on the compression and exhaust or up or outward strokes of the piston, the latter tends, by reason of the angularity of the connecting-rod and the pressure on top of the piston, to press closely against one side of the cylinder, causing all the clearance to be between the opposite side of the piston and the cylinder. On the intake or first down or inward stroke there is probably little change in this respect as the piston is being pulled down by the connecting-rod, unless perhaps the top of the piston may be rocked across to the opposite side by reason of the change in angularity of the connecting-rod at the top of the stroke. But on the firing or second down stroke, that is, the stroke following the compression stroke, as soon as the crankpin passes dead center and the explosion occurs, the side pressure on the piston is immediately transferred from one side of the cylinder to the other, and if there is a small amount of play or looseness between the piston and cylinder, that is appreciable clearance as when the motor is cold, what is termed a "piston slap" results. In other words, this "flopping" of the piston from one side of the cylinder directly to the other at the moment of explosion causes a sharp click which is objectionable in motors for use in motor vehicles where quietness is very desirable. The piston of a hydrocarbon motor is usually connected to the motor crankshaft through a connecting-rod which is journaled at its big end on the crankpin and is pivotally connected at its smaller end to the piston centrally of the latter.

"One of the objects of the present invention is to provide means for opposing the rocking action of the piston on its support, usually the piston pin, at the top of the stroke.

"Another object of the invention is to oppose or prevent the piston from rocking suddenly on its pin at the top of the stroke, thus eliminating a slap at that time.

"Another object of the invention is to arrange the piston pin of a motor such as hereinafter described in offset relation with the center of the piston or cylinder, and preferably only slightly offset, to thereby retain the position of the piston at or near the top of its stroke, and prevent its sudden rocking.

"Another object of the invention is to produce a motor in which the piston will not rock or slap suddenly from one side of the cylinder to the other.

"These and other objects of the invention are obtained in the motor illustrated in the drawing forming a part of this specification, and in which the figure is a vertical transverse section of a motor embodying one form of this invention.

"In the drawing, Fig. 4 the invention is illustrated in a strictly vertical hydrocarbon motor of the four-cycle type. It is particularly applicable to this and other upright motors such as multiple cylinder motors of the V-type, as distinguished from horizontal motors."

The Packard company states that exhaustive tests were run and these showed to the satisfaction of the Packard engineers that there was no difference in the wear of the piston walls and the motor was not slowed down in any respect while there was a gain in power, due to the ability to use a freer fitting piston.

A Good Remedy for Blow-Outs

Editor THE AUTOMOBILE:—All motorists know that among the many forms of tire trouble the blow-out, which nine times out of ten occurs near the bead, is the most serious; the inner patch or the inner lining does not help the trouble a very long time; only a costly vulcanizing job can make the injured casing again fairly serviceable and many people discard the tire rather than go to the expense.

A rapid and very economical way to repair a blow-out consists in simply lacing up the injured part with ordinary wire belt lacing. A good repair job can easily be done in about 15 or 20 minutes, proceeding as follows: First, cut away the loose rubber around the blow-out so you can extend the lacing one inch or so beyond each extremity of the "wound." Second, with a stout hat pin or a sharp nail, punch a sufficient number of holes around the edges of the cut, being careful to get them equidistant, yet not too close together. Next, lace up the cut, with the wire lacing, just as you would lace an ordinary belt, but in this case allow only one strand through each hole; be also very careful to equalize as much as possible the tension of the wire strands. A double row of wire lacing (one over the other) will be much

stronger than a single one. Finally, place a piece of canvas or cardboard or leather, inside of the casing, over the laced part, so the inner tube cannot be injured. You have then a repaired tire that you can again depend upon for a good many miles. The writer got recently 1,200 additional miles, with a repair as explained above, out of a blown-out 36 by 4 1-2 casing that had already 9,500 miles to its credit.

It stands to reason that wire belt lacing that is capable of lacing up a 100-horsepower belt should equally as well answer the purpose of lacing up tire fabric. The scheme favors greatly the cars equipped with demountable rims or wheels; the last ounce of possible use can be handily extracted out of an injured tire, whether the blow-out is premature or not.

It is essential that the wire lacing employed should be of the best wire lacing obtainable, which has not only an enormous tensile strength but which possesses also a remarkable amount of resistance to torsion and flexion. These qualities make it admirably suitable for repairing a blow-out in a prompt and economical manner. An ordinary coil of belt lacing costs but 35 cents and is amply sufficient to repair from ten to fifteen blow-outs, according to the size of the tire.

Arcadia, Cal. C. V.

Ford Engine Suitable for Light Boat

Editor THE AUTOMOBILE:—There has been quite a discussion in this district regarding the placing of a Ford engine in a boat. I would like to have you express your opinion on this. If it can be worked please state how, or why, if it cannot be used to advantage.

Ensley, Ala. E. C. GODFRY.

—There have been several examples where the Ford motor has been successfully mounted in a boat. The exact propeller to use with the engine however, depends upon the weight of the boat. The motor can only be satisfactorily installed in a light, high-speed launch and is not satisfactory for slow, heavy-duty work. Another point which should be observed in installing it is that it should not be put in salt water but in fresh on account of the iron water jackets. The fresh water would not harm the motor but the deposits on the iron water jackets due to salt water would rapidly accumulate to such an extent that the cooling efficiency would be cut down.

Wants Practical Dressing for Tops

Editor THE AUTOMOBILE:—Will you kindly tell me what is a good, practical preservative dressing for automobile tops? Something that will not in the end do more harm than good? I have my machine re-varnished each year, but have not yet found anything good for tops. Perhaps you or some of THE AUTOMOBILE readers can solve the problem for me.

Topeka, Kan. A. H. BENNET.

—The material which you use in your top has everything to do with what is most desirable in keeping it in good condition. If it is mohair, castile soap and luke-warm water are best. The other tops, which are patented fabrics or imitation leathers, etc., will have to be taken care of according to the substance of which they are composed. None of them, however, will be harmed and most of them benefited by the castile soap and water treatment.

Misaligned Wheels Will Affect Steering

Editor THE AUTOMOBILE:—We have for some time been trying to locate a peculiarity in the steering gear used on a 1915 Empire roadster.

The difficulty seems to be in lost motion or side play in some of the parts which is made apparent on traveling over a stretch of rough pavement, for instance, granite blocks, by a continuous hammer jar communicated up through the column. Originally, this gear was apparently right, that is, did not give this jar in passing over rough roads. We have examined all the connections and have taken up play in all the knuckles. What adjustments or remedy would you suggest in order to take out this lost motion and thus eliminate the latter?

Dayton, O. M. G. KOPF.

—Adjustments are provided on the steering gear of the Empire for putting the proper spring tension in the reach rod and also to take up the slack or backlash in the gear by moving the eccentric bushing on the worm gear shaft. This is done by removing the steering arm from the end of the worm gear, loosening the clamping screw on the steering body or chuck, and making the proper adjustment of gears, then tightening the clamping screw holding same in position.

It might be that your car has experienced some jar which has bent the axle, knocking the wheels out of alignment, which would give the trouble you mention.

Two-Throw Crankshaft Disturbs Balance

Editor THE AUTOMOBILE:—What are the objections, if any, to a crankshaft such as illustrated in Fig. 5.

With a firing order of 1, 3, 2, 4, and proper counterpoise, would this scheme cause any unusual vibration of the motor?

Princeton, N. J. A. K. CHAPMAN.

—The great objection to this method of manufacturing the crankshaft is that it would be detrimental to effecting a proper balance of the reciprocating parts. The counterpoise which you mention as illustrated would only effect the rotative balance and by having its weight properly arranged no doubt the rotating parts could be brought into proper balance. The reciprocating parts, however, would be arranged in pairs with all of the parts in the forward two cylinders, going upwards, at the time that the parts in the rear two cylinders were going down. This would set up a longitudinal rocking motion due to the couple PP1 as shown in Fig. 6. At high speed this would cause considerable vibration and besides would be a considerable strain on the bolts connecting the cylinders to the crankcase.

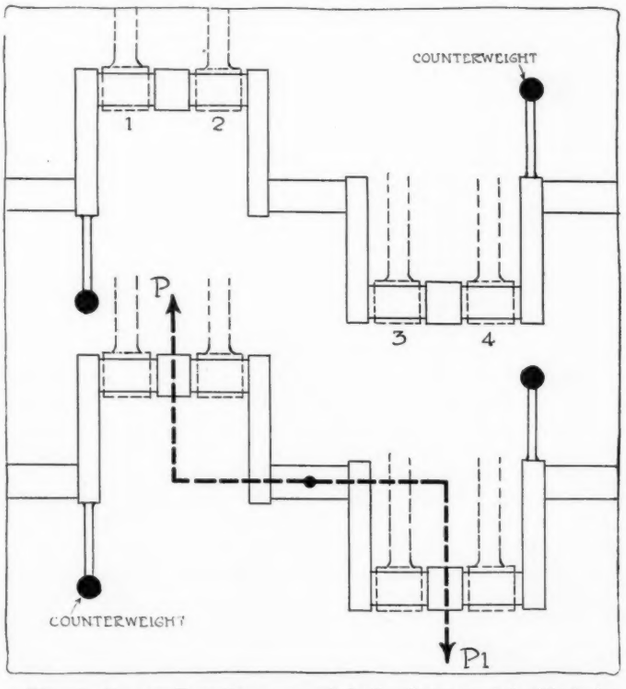


Fig. 5—Upper—Two-throw crankshaft diagram submitted by A. K. Chapman for information

Fig. 6—Lower—Why the two-throw crankshaft is impractical. The couple PP1 would set up a longtitudinal rocking motion which would injure the motor, besides destroying the balance

Definite New Unit for Motor Speeds to Avoid Vague "High" and "Low"

1 Motor Speed=1 Turn Per Second. Proposed by M. C. K.

As everybody knows, 400 revolutions per minute is fairly high speed for a stationary gasoline or oil engine; 600 revolutions was considered high speed for a boat motor until motor boat racing had become well advanced; 1,200 revolutions was the perfectly giddy speed of a Mercedes automobile motor in 1901, and nowadays an automobile motor giving its maximum power at 1,800 revolutions per minute is termed a low-speed motor or a high-speed motor accordingly as the speaker's previous experience has been with aeroplane or automobile motors running at 4,000 revolutions or with the average American automobile motor whose torque begins to drop at 1,000 revolutions and whose maximum power is obtained at 1,200 to 1,500 revolutions. In blithe disregard of the uncertain sense of the term "high-speed," laymen and engineers alike continue, however, to employ this expression with the expectation that the hearer or reader will understand the same by it as the speaker or writer. As in all similar cases, there is a reason. The more accurate and comprehensible terms are inconvenient for common parlance as well as for formal writings. The abbreviation r.p.m. for revolutions per minute refuses stubbornly to be assimilated by the public; it cannot be used outside of technical disquisitions, and with a big numeral in front it makes a very poor descriptive adjective, even in an S. A. E. Bulletin. With the present tendency toward changes in motor design which increase the motor speed and the need of speaking of the subject both informally and formally, there is occasion for a little effort to make it easier to refer to the speed properties of a motor without breaking the flow of language, upsetting the structure of a sentence or making the layman feel that now he can quit listening or turn to another page.

When electrical engineers pass resolutions that hereafter a 12-horsepower motor must be called a 9-kilowatt motor, they have all exact reasons in their favor but popular parlance against them, and the change is not readily accepted. But in looking around for a term for motor speeds by which "high-speed," "medium-speed" and "low-speed" can be relegated to oblivion, the chance for reconciling technical and popular requirements very acceptably seems better.

"25-Speed" a Speakable Adjective

If 1 revolution per second is termed a "speed," a motor giving maximum power at 600 revolutions per minute becomes a 10-speed motor, one giving maximum power at 1,800 revolutions per minute becomes a 30-speed motor, one of 1,200 revolutions per minute becomes a 20-speed motor, and so on. In all cases the expression appeals to the intuition, because a 20-speed motor, for example, is one which makes 20 turns in 1 second, and the mind can grasp what that speed means, while it is quite unable to grasp what 1,200 revolutions per minute means in the way of rapidity of rotation, without first dividing by 60 to find out how many turns per second it stands for. The revolution counter on the testing stand also works by the second, and the second is in all respects a more standard unit than the minute for all other measurements excepting horsepower. The system gives no real difficulties for intermediate motor speeds. A 1,400 r.p.m. motor becomes a 23-speed motor, with sufficient accuracy; a 2,500 r.p.m. motor becomes a 42-speed motor. This is more likely to correspond with reality than the large figure in round hundreds per minute, which is nearly always roughly approximated.

The relation to piston speed is simplified. All one has to do, to find the piston speed in feet per minute, is to multiply the speed figure by the stroke in inches and the product by 10. The piston speed of a 42-speed motor with 4 inch stroke, for example, is $42 \times 4 \times 10 = 1{,}680$ feet per minute.

In practice, if this system of parlance is adopted, the mile-posts of motor speed—the divisions in which people think—will of course quickly be moved from the figures corresponding exactly to the round hundreds of the present method, and the even figures with the new system will take their place. Or, in other words, nobody will think of 1,320 revolutions per minute when a 22-speed motor is mentioned but will know directly whether a 22-speed motor is what he would call high-speed or low-speed in comparison with other motors he has known.

Obviously, by taking 1/100 minute instead of 1 second as the period for "a speed," a motor of 600 r.p.m. would become a 6-speed motor, one of 1200 r.p.m. a 12-speed motor, and so on. There would be a little less friction at first in adopting this unit than the other. Also, a motor making, say, 1560 r.p.m. could be known as a 15.60-speed motor, with a sop to accuracy. But, with a view to permanent advantages, the simple relation to 1 second is probably preferable, because, with it, fractions can be avoided with smaller average error. The motor with 1,560 r.p.m., for example, is, with the 1 second unit, simply a 26-speed motor. The S. A. E. could at all events decide which unit should be adopted.

The Public Is Willing

Only a little persistency is probably required to introduce a new term which has practical advantages. Some years ago, for example, the proponent in this case had frequent occasion for mentioning the carbon contents and alloy contents of steels and found it troublesome to refer to the quantities of small admixtures as multiples of one-hundredth of one per cent. By adopting the term "a point" for this percentage he was enabled to speak about a steel having 15 points of carbon and 65 points of manganese or of a 4-point phosphorus steel instead of using the awkward decimal and sub-decimal notations, and after he had done so for some time others began to adopt that way of speaking, which is convenient and does not clash with the use of percentage, being only the use of a 100-times lower unit in addition.

If the few writers on metallurgical subjects who took favorable notice of the little innovation—for which no argument was offered—had continued the practice independently, it would, judging from indications, have been generally accepted today as a convenience in terminology.

Another example, showing how readily a practicable change in terminology can be accepted if it is only resolutely employed in print and speech during the psychological period, is given in the term "denatured alcohol." Up to 1905 "denaturized" and "denaturated" were the accepted forms, but the writer employed "denatured" instead, with a brief argument for the preference, and this shorter and better form was silently adopted by experts and congressional debaters and was employed throughout the subsequent legislative enactments on the manufacture and use of ethyl alcohol for industrial purposes. "Denaturized" or "denaturated" has seldom been heard or seen in print since.

The Engineering Digest

Sizes Required of Wheels and Tires in Heavy Traffic, for Road Protection

WIDTH of tires for tractors and trailers must sooner or later become a subject on which legislation will be demanded, in view of the need of protecting road surfaces against damage from excessive loads and speeds. Activity in road building and the incipient agitation for the use of trailers in connection with motor trucks are now adding a touch of actuality to this matter which has troubled vehicle builders and road authorities in England for a number of years. W. W. Beaumont's formula for tire widths may in this respect be of interest, as it is intended to afford an improved basis for the regulation of construction and traffic, as compared with the rules laid down in the Heavy Motor Car Order of 1904. These rules, Mr. Beaumont points out, are involved and difficult to follow, mainly because the wording of the enactment refers to axle loads instead of wheel loads, but they also fail to encourage the use of large diameters for wheels, although experience has shown that the large wheels save the road considerably, and they prescribe a maximum speed of five miles per hour which cannot be enforced.

The formula designed to take their place refers to hard tires only and reads:

$$W = B\,D\,21$$

in which W = the load or weight permitted on a wheel in pounds, while B = the width of the tire in inches and D = the diameter of the wheel in inches. By applying this formula the values given in the appended table are obtained. The figures therein may thus be taken as embodying the experience of Great Britain in this matter for the period 1904-1915, as interpreted by a well-known authority. He explains:

"These figures do not, of course, relate to vehicle loads on rubber tires. . . . It is, however, more generally recognized than it was even a year ago, that the wear of roads by the ordinary motor omnibus and the motor lorry on rubber tires was only noticeable on roads with a friable surface."

TRACTOR AND TRAILER TIRE DIMENSIONS FOR PERMISSIBLE WEIGHT ON A WHEEL IN POUNDS

Dia. of wheels in in. \ Width of tire, in inches	5	6	7	8	9	10	12	14
30	3,150	3,780	4,400	5,040	5,859	6,300	7,570	8,800
33	3,460	4,150	4,850	5,544	6,237	6,920	8,300	9,700
36	3,780	4,550	5,270	6,048	6,822	7,650	9,100	10,600
42	4,400	5,300	6,170	7,056	7,938	8,820	10,600	12,370
46	4,830	5,800	6,750	7,728	8,694	9,655	11,600	13,250
48	5,050	6,050	7,050	8,060	9,172	10,070	12,100	14,100
54	5,670	6,800	8,510	9,070	10,180	11,350	13,600	....
60	6,300	7,570	8,830	10,000	11,300	12,600	15,100	....

Single and Dual Sparks in T-Motors and L-Motors—Castor Oil Facts

SOME tests conducted at the F. N. works of Herstal, Belgium, before the German army took possession, gave results which neatly summarize the answers to questions frequently asked by motor vehicle owners.

Lubricating with castor oil.—Although castor oil (specific gravity .962) has higher flash and ignition points (255 degrees and 315 degrees, respectively) than ordinary cylinder oils (210 and 265 deg.), and though it leaves no trace of corrosion and less of it is required for good lubrication than of any other oil, ordinary oil should still be given the preference for use in automobile motors for the following reasons: The use of castor oil reduces motor power about 1 per cent.; it leaves on the top of pistons a coating 50 per cent. heavier and more adherent, resulting in a more nauseating exhaust odor. Being more nearly colorless, castor oil is not easily observed in sight glasses, and it is not soluble in gasoline but only in alcohol.

Ignition by single or dual spark.—When a single camshaft is used and the combustion chamber is compact in shape, the double spark gives no advantage.

With two camshafts and two spark plugs placed over the inlet and exhaust valves, respectively, the following results were recorded: With two sparks the angle of spark advance is twice as small as with one; the efficiency of the motor is improved; timing can be omitted without reduction of the power, but the motor knocks when slowed down. The knocking is avoided by using magnetos with spark advance.

Location of spark plugs.—In a motor with single camshaft the spark was produced, successively, over the inlet valves, in the cylinder axes and over the exhaust valves. The location over the inlet valves, which agrees with common practice, was found to produce a very small power increase. No appreciable difference was noted, whether the terminals were projecting or recessed.

In a motor with two camshafts the location of the spark over the inlet valves gave a marked increase of power, as compared with the location over the exhaust valves. The latter method produced slower inflammation, as shown by backfiring when the motor speed exceeded 1,800 turns per minute. To have the plug project into the combustion chamber produced, with this construction, a 1.7 per cent. increase of power at 1,700 turns per minute.—*From Génie Civil.*

Drop-Forging Art Held Back by Too Many Specifications

ACCORDING to a paper by Arthur Stubbs which was read before the Institution of Automobile Engineers last month the wider adoption of drop forgings for automobile parts is hindered in England not only by the relatively small output of the average British manufacturer, which makes the cost of dies high, but also by an unsettled condition with regard to the question of who should decide the grade of material to be used for a given design. It is usual for the motor car manufacturer not only to specify the material but also the tests to which it is to conform. The steel maker and the forger can then both retort, in the case of failure, that the steel was not suited for the design. Mr. Stubbs recommends that the whole responsibility be placed upon the forger and that he be held to produce forgings which will stand specified physical tests. This would compel closer cooperation with the designer before work is undertaken and would lead to a more widespread understanding of the different flowing-properties of alloy steels. He mentions that for drop forge work nickel steels show a tendency to develop fissures and surface defects, that chrome-nickel steels are liable to be spoiled by the re-heating which becomes necessary on account of their toughness, and that chrome-vanadium steels generally give better results, being easier to forge and machine while having high shock resistance.

$200,000,000 for Kansas Farmers—Car Sales Boom

(*Continued from page* 1063)

2 months there has been no word from the city hall nor the Metropolitan Street Railway company regarding the jitney business. There are nearly 500 small cars and buses operating in this city while from several small towns just outside Kansas City regular service has been established.

There are now forty-two jitney buses operating, all of them except ten, on regular touring car chassis with bodies made at home or in Kansas City carriage company plants. The ten cars that are not on regular touring car chassis, were made by the Studebaker company for regular jitney bus trade and involve special axles and tires. They are pay-as-you-enter cars. They are operating over one route about 3 miles long and maintain a 4-minute schedule during the busy part of the day and a 7-minute schedule the rest of the time.

They are operated by the Kansas City Jitney Bus Transportation Co. They have been in operation almost a month and W. F. Miller, the president of the company, says the average earnings of each bus per day is $20. From this Mr. Miller figures that he can junk each bus at the end of a year and buy a new bus of the same kind at a cost of $1,200 and show a good profit. This company expects to have forty buses operating inside of 2 months.

Co-operative Co. of Bus Owners

Another innovation in the jitney business here is the formation of a co-operative company of bus owners. Ten have banded themselves under the name of the White Star Line and are establishing a service that closely resembles the Kansas City Jitney Transportation Co. line.

Locomobile Refines Both Sixes for 1916

(*Continued from page* 1075)

series wound, weighs 21 pounds and develops about .7 horsepower at 5.25 volts. It revolves the 38 at about 125 r.p.m. and the 48 at about 115 r.p.m.

A feature of the lighting system is the lock-switch which has a night and day arrangement. There is also an On position which renders all the lights, horns and ignition switches operative. In the day position all the lights are disconnected, the magneto grounded and the starter disconnected so that it cannot be used. Thus if the car is left anywhere in the day time it cannot be tampered with. In the night position the lights are connected, the tail and side lamps being on and cannot be turned off while the starter cannot be used.

With the ignition system, the magneto is set so that with the spark fully advanced the spark occurs while the piston is still 7-16 inch from the top of the cylinder on the 48 and 5-16 on the 38. On the battery system, the breaker is set to make the spark a little later than with the magneto when the spark control is set to full retard. This is done to make cranking safe in case of failure of the cranking system. The firing order is 1-5-3-6-2-4.

Clutch Entirely Redesigned

The clutch, which is entirely new for this season, is a dry-plate design with a cast steel housing bolted to the flywheel and driven with it. The housing contains six hard steel keys riveted to it and equally spaced about its periphery. Meshing with the keys are nine thin saw steel disks, each 1-16 inch thick. The clutch disk retainer also has steel slots and eight saw steel disks which mesh with it. These disks are free to move in a lateral direction along the axis of the clutch and forming the driven member. Between each pair of driving and driven disks is a heavy woven fabric disk of material much resembling brake lining. These fabric disks are floating and neither driven nor are driven but serve merely as a medium for transmitting the driving torque from the driving to the driven disks. This new clutch design provides a smooth engagement.

Four speeds are provided in the gearset, the first having a ratio of 14.152 to 1, the second 6.793 to 1, the third 4.950 to 1 and the fourth 3.538 to 1. The reverse is 20 to 1. The drive is taken through a chrome-nickel steel shaft with a full universal at the gearset end and a block and pin type at the rear axle end.

A floating rear axle is used, the Locomobile design of seamless steel tubes forced into the rear axle housing under heavy pressure and then riveted being continued. The axle shafts are chrome-nickel steel. The gears are spiral bevels of 4-pitch, manufactured from chrome-nickel steel, and the floating construction is carried out to permit the entire dismounting of the bevel gear differential and live axles without even jacking the car. A torque rod is anchored to the rear axle housing and engages with the rear gearbox cross member by means of a shackle.

The front springs are 38 by 2-inch semi-elliptics and the rear 50 by 2.5 3-4 elliptics. The eyes are bronze-bushed and the shackles are drop-forged with steel shackle bolts. The springs are fastened with alloyed steel clips. The frame is made up of pressed steel channels, the side members being 6 inches deep with 1.75 inch flanges and made from 5-32 stock. The material used is chrome-nickel steel and all members are hot riveted together, the holes being drilled and reamed.

Two Concentric Brake Drums

Brakes are carried on the distance rods which absorb all braking torque. There are two concentric drums, spaced apart, allowing air space for cooling. The body straddles the chassis and is supported on three bronze brackets on each side and also by the two top leaves of the rear spring which are extended beyond the spring perch to permit fastening the body to it. Both stock and custom bodies may be furnished with the cars, but the feature of construction is the sheet aluminum paneling over wood frames, securing lightness and strength. The rear doors on the open bodies are 25 inches wide and on the closed bodies, 26 inches. The front doors on the touring cars can be opened forward for ventilation and the entire body is fitted out for great luxury. A special feature of the windshield is that the lower half is independent of the upper and either may be swung into any desired position. The upper glass overlaps the lower so that no rain can enter. Left drive and center control are used with emergency lever on the left. Tires for the 38 are 36 by 4.5 front and 37 by 5 rear. For the 48 they are 37 by 5 all around.

The prices are: for the 38 for six-passenger touring cars and seven-passenger touring cars, $4,400; limousine, $5,400; landaulet, $5,500, and Berline, $5,700. For the same bodies on the 48 the prices are, respectively, $5,100, $6,200, $6,300 and $6,500, with full equipment.

The Automobile

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S. A. E. Still Growing

TO talk of the remarkable progress of the S. A. E. has become platitudinous and there is no longer any need to argue that it is a powerful society which is doing a power of good work. But when a person or a concern is making great headway, when he or it is making a great success; right then is the time to beware of the rocks.

The S. A. E. has been fortunate in the possession of officers who appreciated this truism at the full, with the result that a success once scored by the society has always been taken as simply a stepping stone to the next accomplishment. The meeting at Detroit last week was chosen as an opportunity for several of the men who have made the S. A. E. what it is to express their conviction that now is the time for redoubled effort on the work of standardization, that the usefulness of the few standards already adopted must not be regarded so much as proof of work *done* as proof of the work needed *to be* done.

The cry for more members from the executive side of the automobile industry is one which every engineering member should heed, for it is up to executives to use what the engineer provides and, if he makes standards with an eye to their money saving value, the fact must be brought home in the proper quarter. Far the best way to do this is to get the executive men to the meetings and on the membership roll and this is to be the great endeavor of the coming year.

110 Miles an Hour

THE completion of the Chicago 2-mile board speedway with its scientifically-banked board surface has already opened a new régime in motor racing and the average speed for a lap on American speedways has within a week jumped from less than 100 miles an hour to over 110 miles per hour. Since the conception of the Indianapolis speedway, the American public has been inclined to think that averages between 80 and 100 miles per hour were the limits of racing cars today, but this delusion has been dispelled. Chicago's track has already proven that the high-speed car is valueless without a scientific track for it to run upon. For years Brooklands has held top figures in speed performances, first because the track was properly constructed and second, due to the English makers building cars that were capable of speeds as high as 125 miles per hour.

Now that tracks are being built in America which will contain speeds it is hoped, up to 140 miles an hour, it remains for our manufacturers to build cars that will have speeds up to the limit of the track, a nice engineering problem.

The May-June Dilemma

THE sentiment is growing that automobile manufacturers are erring in disturbing what should be the best selling period of the year, namely, the months of May and June by the announcement of new models during these months and thereby not only disorganizing the entire selling forces of the country during this period, but also upsetting the mind of the prospective buyer.

There has been a strong sentiment against this annual May-June program, but manufacturers seem insane on getting their announcement before the public at the earliest moment, in some cases irrespective of the best interests of their dealers. The present work of the National Automobile Chamber of Commerce to change this condition will not meet with very early success because manufacturing concerns will continue to use those policies which they think best suited for their particular needs, consequently, it would seem that the spring disturbance is scheduled to continue for some time to come.

The most unfortunate aspect of this spring disturbance is that hundreds of dealers are brought out of their territories to the factories during this period. May and June would seem to be months when these dealers should be at home, pushing the sales and perhaps lending every aid in clearing up the last cars. These dealers would find it more convenient to visit the factories at other seasons when home needs are not so urgent.

Some manufacturers are making an error in announcing their new models before they are ready to make deliveries to customers. It is a good plan to start your selling campaign well in advance of when you hope to make deliveries, but it is questionable business to put on a selling campaign for prospective buyers and not have the goods on the counter that these buyers want.

Buick Plans 400 Cars Per Day

Factory Additions Make 60,000 Cars for 1916 Possible—50 Per Cent. Sold

FLINT, MICH., June 12—When the additions to the Buick Motor Co. are completed and the new machinery installed, which will be within the next 3 weeks, production will average 400 cars a day. With an output of 60,000 cars planned for 1916 or 15,000 more than this year, it is stated that since the announcement of the new sixes was made less than 2 weeks ago, more than 50 per cent. of the total scheduled production has been contracted for, by those dealers and distributors who have thus far visited the plant this month.

From Monday June 7 to this day, more than 800 dealers, distributors and subdealers have been or still are at the plant.

Timken to Add Cold Drawing Steel Plant in Canton

CANTON, O., June 10—Provided proper switching facilities and the vacation of part of an alley can be obtained, a new department, a cold drawing steel plant, will be added to the Timken Roller Bearing Co. in Canton, O.

The new plant which will produce a new product will employ 150 men at the outset. It will be in a building 300 feet long and 100 feet in width and will be located adjacent to the roller bearing factory off Deuber avenue. At first there was some discussion of locating the new plant in Detroit where most of the output will eventually be sold, but the Chamber of Commerce induced the Timken company in connection with the Detroit plant officials to locate the factory in Canton.

U. S. Rubber Output Gains 30%

NEW YORK CITY, June 15—The United States Rubber Co.'s tire output is running 30 per cent ahead of last year. The company is now stocked up with crude rubber costing about 8 cents a pound below the present market quotations. The average output, including both the Detroit and Harford works, is now slightly over 9,000 automobile tires a day. With a little more machinery, the Detroit plant alone will be in a position to manufacture 10,000 tires a day. Officials of the company expect a production of approximately 1,500,000 tires this year.

Fisher Buys Universal Plant

DETROIT, MICH., June 11—The Fisher Body Co. has purchased the four-story plant of the Universal Motor Truck Co., Theodore street, and 3 acres of ground property of the truck company. The deal involves $120,000 it is claimed. This is the second big purchase made by the Fisher Body Co., within a few weeks, the first being that of the bankrupt Detroit Body Co., for a consideration of $170,000.

Business of the Fisher company has been increasing so rapidly that even with these additional plants it is possible that further additions will be necessary. The added business comes from the regular customers who have ordered from 50 to over 100 per cent. more bodies for their 1916 business than for 1915.

New Velie Six Reduced $530

MOLINE, ILL., June 11—The Velie Motor Vehicle Co., Moline, Ill., has made public the first details of a new six-cylinder Biltwel model which is to sell for $1,065, a reduction of $530. The car is slightly smaller than its $1,595 companion, and is equipped with a 3 1-4 by 4 1-2 Continental motor with removable cylinder head. Drive is through a dry multiple-disk clutch, three-speed selective gearset and floating axle. Remy electric lighting and starting apparatus is standard equipment. Tires are 32 by 4 inch with non-skids in the rear.

Buys Zephyr Carburetor

DETROIT, MICH., June 12—The P. R. Mfg. Co., 621 Bellevue avenue, which for 20 years has been a manufacturer of electrical and metal specialties, has purchased from G. A. Breeze the patents and rights to manufacture and sell the Zephyr carburetor, which the company has already started the marketing of.

$50,000 Bldg. for Republic Truck

ALMA, MICH., June 14—After considerable bickering the plant of the Republic Motor Truck Co. has been assured to Alma, Mich., through the raising of $10,000 by the board of trade of that city as first payment on the building being used by the company. The building will cost $50,000. The plant has been forced to work a night shift in order to catch up on its orders, and the company expects to turn out more than 300 trucks during the present month.

Saxon Triples May Shipments

DETROIT, MICH., June 12—Three times as many cars were shipped by the Saxon Motor Co., in May, 1915, as during that month in 1914. It was at the same time the biggest month the company had since in business. More than 3,500 orders for fours and sixes were on the books when June started, and in all probabilities this will be a still bigger month than May. Since the first day of June the daily average has been 120 cars. This is at the rate of 3,120 for the whole month on a basis of 26 working days.

Ship 1,282 Chandlers in May

To Build Over 10,000 This Year—103 Shipped in 1 Day Is Record

CLEVELAND, O., June 12—During May the Chandler Motor Car Co. shipped 1,282 cars valued at $1,666,190, an increase of 493 per cent. as compared with May, 1914. The biggest day's production was May 29 when 103 cars were shipped. President F. C. Chandler states that before the end of 1915 more than 10,000 cars will be built and shipped by the company. Although the plant has been enlarged the increasing production will probably require further additions. Several of the final test departments are housed at the present time in two large circus tents.

The daily production average has steadily progressed since early in April. By April 1 the company was shipping forty cars per day; by May 5, fifty cars per day; by May 20, sixty cars per day, while an average of ninety per day was maintained for the last week in May.

Franklin ½-Year Business 64% Better Than 1914

SYRACUSE, N. Y., June 10—The Franklin Automobile Co., this city, shows a 64 per cent. increase in business for the first 6 months of 1915 over the same period last year. Sales are 39 per cent. greater. The business increase represents shipments only, the factory not having been able to keep up with the demand, actual orders received being 90 per cent. over last year.

Holders of the company's preferred stock have been notified that the company will take advantage of its option and retire all the stock on July 1, paying thereafter $110 per share and accrued dividends. The stock was sold in 1913 at par.

A large addition to the Franklin plant is about to be erected on Geddes street. The building will be of fireproof construction. Plans are being worked out for a still larger addition, the construction of which will probably be started in the early fall.

Goodyear Managers Meet in St. Louis

ST. LOUIS, MO., June 12—A conference of the Goodyear Tire & Rubber Company's branch managers was held here today. District Manager M. H. Parsons and St. Louis Branch Manager W. E. Finney, entertained the managers from Kansas City, Oklahoma City, Dallas, Houston, and San Antonio. Business conditions generally and the company's business in particular were discussed.

Artemas Ward, Jr., Heads King

Succeeds J. G. Bayerline—F. A. Vollbrecht Is Vice-President and General Manager

DETROIT, MICH., June 14—Following the resignation by J. G. Bayerline as president of the King Motor Car Co., comes the announcement that the board of directors has elected vice-president and advertising manager Artemas Ward, Jr., as president, and secretary and treasurer F. A. Vollbrecht as vice-president and general manager. Mr. Vollbrecht will also continue as treasurer of the company.

The announcement of the changes was made at a dinner given by officials of the King company to Mr. Bayerline at the Statler Hotel tonight. It was with regret that Mr. Bayerline announced that other plans which he had been formulating caused him to sever his connections with the King company to devote his undivided attention to the new proposition. At the present he is unable to announce his plans.

As a result of the changes, J. B. Seigfried, factory production manager and purchasing agent, takes the position of assistant general manager in charge of the factory. J. R. Emerson is purchasing agent, W. L. Daly continues as sales manager, while H. C. Bradfield resumes his duties of sales promotion and advertising manager at the factory.

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Car Exports to Argentina

WASHINGTON, D. C., June 12—American-made cars imported into Argentina increased from 10 1-2 per cent of the total automobile imports into that country in 1912 to 19 per cent in 1913, though they dropped 30 per cent in 1914, owing to the depression in trade, according to the latest official returns which reached the Bureau of Foreign and Domestic Commerce.

Total automobile imports into Argentina in 1913 were valued at $5,194,200, the countries of origin being France, the United States, Germany, Italy, the United Kingdom and Belgium in the order given. Thus the United States jumped from fourth place in 1912 to second place in 1913, its actual and relative gain being greater than in the case of the other nations.

In 1914 the world-wide business depression affected all automobile exports into Argentina, those of the United States dropping to but a little over a third of the total for 1913 and the other countries' shipments falling in proportion.

The following table, from the official Argentine publications, gives the number and value of automobiles imported into that country in 1911, 1912, 1913 and 1914:

Imports of Automobiles Into Argentina, 1911 to 1914

Year	Number	Value
1911	2,461	$2,346,600
1912	4,281	5,159,000
1913	5,115	5,194,200
1914	2,185	1,105,700

Imported from	Number 1912	Number 1913	Value 1912	Value 1913
France	1,651	1,830	$2,252,800	$1,914,900
United States	708	1,296	544,000	1,003,600
Germany	627	761	822,300	848,800
Italy	422	425	547,200	492,500
United Kingdom	451	412	430,500	471,800
Belgium	295	302	433,900	351,200
Other countries	127	89	128,300	111,400

—

Government Awards Motor Truck Contracts

WASHINGTON, D. C., June 11—The general supply committee has awarded the following contracts for furnishing the executive departments here with motor vehicles during the fiscal year beginning July 1, 1915:

The Waverley Co., Indianapolis, electric truck, 1,000 pounds capacity, $1,660; with screen side express body, $1,920; with standard full panel body, $1,925.

Fifteen hundred pound electric truck, no award.

The Waverley Co., 2,000-pound truck, $2,095; $2,385; $2,425; $2,450.

Kentucky Wagon Co., 2-ton electric truck, $2,650; $2,985; $2,010.

Baker Motor Vehicle Co., Cleveland, O., 3-ton electric truck, $2,975; $3,360; $3,435.

Eight hundred to 1,000-pound gasoline truck, no award.

Commercial Automobile & Supply Co., Washington, D. C., 1,500-pound Studebaker truck, $1,025; $1,125; $1,125.

The White Co., Cleveland, O., 2,000-pound truck, $1,835; $1,950; $2,150.

Velie Motor Vehicle Co., 3,000-pound truck, $2,025; $2,155; $2,159; $2,169; 2-ton Velie truck, $2,280; $2,324; $2,470; $2,490; 3-ton Velie truck, $2,680; $2,882.-70; $2,908; $2,940.

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Stearns Building 5-Story Plant

CLEVELAND, O., June 9—The F. B. Stearns Co., this city, has broken ground for immediate erection of a five-story concrete factory building. The new building is being erected on the 6-acre site owned and now partly occupied by the company's plant. It will have a frontage of 175 feet on Euclid avenue, extending back 75 feet toward the Nickel Plate railroad which marks the northern line of the company's property. It will be completed about October 1.

The Stearns company has promoted T. A. Boyle to the position of advertising manager and manager of the service department. G. W. Vaughan has been appointed special sales representative.

New Canadian Ford Plant

Six-Story Building Adds 145,000 Square Feet—Roof and One Side of Glass

FORD CITY, ONT., June 12—An addition, 700 by 45 feet, will be started by the Ford Motor Co., of Canada, Ltd., in a few days. It will be a six-story structure and might almost be called a glass house, as the side facing the river and the entire roof will be of glass. It will be erected upon a site which was formerly part of the river but which the company started to have filled 2 years ago. From 300 to 500 piles, 35 to 40 feet long, will be used to support the new building which will cost about $85,000.

Second Addition in 14 Months

This is the second big addition to the Canadian Ford plant within about 14 months. The other addition, a six-story building, 210 by 194 feet, is now almost completed and with the two additions the total floor space of the plant will be increased by 145,000 square feet.

The Ford business has been growing rapidly during the last 2 years and this year especially it has been very good. From an output of 100 cars a day the average has passed to near 200 a day and it is planned to increase this to 300 or more this year.

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40,888 Fords in May

DETROIT, MICH., June 12—Production of Ford cars during May totaled 40,888 or 5,630 less than in April. Nevertheless there need be no fear that the scheduled 300,000 Ford cars will not be made and sold, as predicted by the Ford company, by the end of the fiscal year, July 31. Including the May output there have been made and shipped 251,321 Fords, thus leaving 48,679 to be made in June and July or 24,339 each of these 2 months.

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Crescent Bond Issue Attacked

CINCINNATI, O., June 10—In the matter of the Crescent Motor Co., of Carthage, bankrupt, petitions were filed in the United States district court by Thomas L. and J. Lloyd Wayne, setting up claim of ownership of 100 shares of common and 100 shares of the preferred stock of the Crescent Motor Co. and attacking the validity of the company's bond issue of $100,000 on the ground that the preferred stock held by them contained the provision that no mortgage should be given on the property without the consent of the holders. They ask the court to decree the bonds null and void as to them and that their rights be protected.

Engineers in Session on Georgian Bay

Noronic Delayed 5 Hours by Fog—Program Goes by Schedule—President VanDervoort Asks for High-Grade Members—Society Must Grow and Broaden—Many Papers Read and Discussions Good—Compare Eights and Twelves

MIDLAND, ONT., June 15—*Special Telegram* from steamer *Noronic*—Carrying out the announcement made by President W. H. VanDervoort, the business of the Society of Automobile Engineers, on their summer cruise through the Great Lakes, is proceeding strictly according to schedule, although the cruise itself has been delayed by fog and the trip through the 30,000 islands will be made Wednesday morning.

The meeting started at 4 o'clock yesterday when President VanDervoort made his address of welcome, the keynote of which was the advancement of the Society through the most rigid scrutiny of the quality of applicants for membership and an application to the tasks at hand.

The report of A. B. Cumner, treasurer, showed the affairs of the Society covering the last fiscal year to be in excellent condition. The cash balance on hand at the close of the fiscal year, May 31, 1915, amounted to $13,309. One hundred and five new members have been added to the Society besides which there are a large number still to be approved by the Council. Of these added twenty-seven are full members, twenty-three associates, twelve juniors, five affiliates and thirty-eight students' enrollment.

New Nominating Committee

Election of the nominating committee resulted in the appointment to this committee of H. G. McComb, from the Metropolitan section; K. W. Zimmerschied, from the Detroit section; Howard Marmon from the Indiana section and at the general election, B. B. Bachman, Henry Souther, David Ferguson and J. G. Perrin.

A vote of thanks was passed by the members to the Detroit factories who had furnished cars and entertainment to the members while in Detroit. Besides this there was no new business and the professional part of the meeting was immediately begun.

President VanDervoort opened the meeting by a few words of welcome, stating that he hoped that this would be made the most enjoyable meeting ever held by the Society both as a real respite and in the way of benefits which would be brought to the members. Speaking of the development of the industry, he stated that it had figuratively in 1 day grown to marvelous proportions. He said that it had developed so rapidly that it cannot be compared to what it was 15 years ago. The prophecy, carriages without horses shall go, has been a true one. It has produced changes in the mode of life. The countryman is no longer isolated and the business man finds that the increased efficiency in being carried at about the speed possible with automobile, that he has more time to devote to his business. The Society of Automobile Engineers will advance to great prominence among engineering society circles. It should aim to have a strong engineering membership and should have good quality of membership so that a membership in the Society will be a real asset. This can be reached by a careful scrutiny of the applicants. The requirements for all membership in the Society must be raised and before it can be attained the applicant should have the proper experience and training. Care must be used to guard against commercialism, and there is disaster in the tolerating of commercialism. The Society must be broad in its treatment of ideas. Years ago, conditions in the industry were such that the membership of the Society suffered a loss. For inability to pay dues and for other reasons eighty were dropped in February, but at the present time the loss is only four more than the gain and there are still a number of names to be passed upon by the council. At the present time the Society has a student enrollment of fifty-one.

The treasurer's report is excellent The Standards committee has been going steadily forward and while the development of the standards is necessarily slow as it takes time to mould the opinion. Progress is being made rapidly while the cars produced by different manufacturers will always differ in a large number of details. Still, there are many parts which can be made alike in all cars and the committee is striking these vulnerable spots.

President VanDervoort recommended the taking of a letter vote in the adoption of a new standard rather than in a vote at the open meeting because in that way a number of these who could not vote otherwise would be able to put in their votes. Another point mentioned was that the National Automobile Chamber of Commerce had again pledged $3,500 to be given to the S. A. E. for the furtherance of its work.

In contrasting former methods with those of today, President VanDervoort stated that the idea at first was to produce the greatest reliability and cost considerations were secondary. Now the cost considerations are paramount without any of the reliability being sacrificed. The highly systematized work of today is what has enabled the manufacturer to bring the costs of the cars down. Consider the stationary engine, which operating on its fixed base, need give the engineer no concern on weight but only on rigidity. Also consider the locomotive which operates on rails, and which is always in the care of an expert mechanic. How different is the automobile with its highly developed mechanism and with its weight per horsepower reduced to the lowest possible point. The owner is always expecting too much from his car and getting less than the machine is capable of.

Car Not Competing with Horse

The passenger car is not competing with the horse. Its great speed and reliability have rendered it above that, yet the problem of the commercial vehicle on short hauls has not as yet been solved successfully. The long-distance haul for the commercial vehicles is a success but in this good roads are essential. The commercial car has successfully competed with many other types of transportation, even in certain instances with the railroad. A car can deliver goods from the shipper to the purchaser without necessity for transporting to and from stations. Good roads will help, however, in the further development of the commercial car.

Farmers have now accepted the automobile in spite of their former prejudice and we may soon expect to see trucks for hauling farmer's products. During the past year we have seen the results of trucks in warfare, and in our maneuvres the same facts have been demonstrated in hauling troops and provisions.

The automobile parts maker has come to hold a unique position; practically all the car makers go to him for parts at the present time. He can produce the parts cheaper than the car maker and

it is only a few of the largest of concerns that can hope to make successfully their own carbureters, magnetos, etc.

We must work in close harmony with the commercial side of the business. At one time during the last year the supply had caught up to the demand but at the present time the demand is ahead of the supply. However, with the big production schemes now under way this condition will not last long and the engineer must set himself to work to meet the keen competition. The automobile business will not get into a rut quickly. Progress is being made too rapidly for that and we cannot predict what the universal car will be in the future. It might be a four or a twenty-four. Dare we predict what we will be able to give to the public in 1925?

Clutch Field Waiting

Introducing his paper on clutches which was the first on the program, W. F. Herst said that the subject was so little thought about and yet so important that he had ventured to open discussion with a very brief paper. He remarked that the subject was brought especially to his notice by some work done by the miscellaneous division of the standards committee, in which the fact came out that nearly 200 different sizes of clutch facings were used on disk clutches of dry-plate types. This fact in itself showed that the clutch was a part of automobile make-up that the Standards committee might consider.

D. Landau asked whether the triple-cone clutch described in the paper was not an old Panhard invention, and Mr. Herst replied that he had no information on this point, but that the clutch as he mentioned it was now in course of development by a Cleveland man. N. B. Pope suggested clutch action ought to be expressed in terms of slip and that the ideal clutch, according to many engineers, ought to have a degree of slip under the driver's control, so that he could make it grip slowly or quickly at will.

J. D. Waite asked the coefficient of friction upon which Mr. Herst figured, the reply being that it varied very greatly with different asbestos materials, so greatly, indeed, that some of these fabrics were compounds that could not be used for clutches while they were good for brakes.

F. E. Moskovics raised the question of desirable pedal pressure, saying that it varied greatly, and Mr. Herst replied that his tests showed a variation of from 70 pounds down to 12 pounds needed to release the clutch. It was his opinion that a good average would be about 40 pounds.

C. T. Myers' paper on a formula for the comparison of automobile performance was not prepared in time for printing previous to the meeting, and as it is largely mathematical, discussion proved difficult, the members having no reference in their hands. The main theme of Mr. Myers' proposal was that the ultimate thing which determines road performance of an automobile is the effort at the tire which the motor is able to exert. Taking V. C. as the coefficient of the vehicle

$$VC = \frac{8.4\ NB^2\ S\ R}{DW}$$

Where N is number of cylinders, B the bore of motor, S the stroke, R the gear ratio, D the diameters of road wheel in inches, and W the weight of car and load. This when multiplied by two constants representing the mechanical efficiency of the engine and chassis, gives, in the author's opinion, a ready method for calculating the respective road ability of different cars.

He said the formula could be used to show the ability of the car to ascend a grade on high gear and gave some interesting examples, in tabular form, that showed the effect of altering gear ratio or motor size.

Professor F. R. Hutton questioned the character of the formula as depending upon the A. L. A. M. horsepower formula, but Mr. Myers covered this point by saying that it was intended for comparative and not absolute results.

C. W. McKinley, Overland engineer, spoke in favor of accelerometer testing, saying that he found a little practice with the instrument enabled quick determination of a car's condition to be made, which would come as near as 3 per cent. to the laboratory determination on the dynamometers.

Testing Electric Vehicles

The next subject was the determining of a standard electric vehicle test with much the same aim in view as that in mind by the author of the last paper regarding gasoline cars. In the absence of T. H. Schoepf, of the Westinghouse company, the paper was read. W. Conant enlarged on the importance of a standard method for testing, because at present two manufacturers might claim the same performance in 10 miles and yet the capacity of the vehicles be different, solely because of difference in the test details.

R. McA. Lloyd, New York, said that he considered the method of testing suggested was no better than the old method, because the rest given the battery during stops and braking increased its capacity to a great enough extent to compensate for accelerations. The old style non-stop run was easiest to make at prescribed speed, and therefore more reliable.

Commercial Tractors

Recognizing the increasing importance of the tractor as a special field of the automobile industry, two important papers were devoted to phases of it in the Monday evening session. Philip R. Rose presented a valuable discourse upon farm tractors and their motors, while Frank Trego's (Knox company) paper was referred to in the absence of the author. In amplification of his written ideas Mr. Rose said that the tractor holds out great possibilities for the future of agriculture. He cited some interesting statistics to show the enormous expenditure now necessary for what he termed animate power. It takes 5 acres of land to raise enough to feed a horse or mule and when there are 255,000,000 horses with a value of $2,842,000,000, the magnitude of the farm power problem is evident; in fact, the farm power problem is the biggest in any industry in the country. One reason tractors have not progressed further is that they are not used by a class that is up on mechanics, as a rule, and there are no garages or repair shops where they may be intelligently cared for. At first tractors sold as high as $3,000, but now they are available for as low as $600 or $1,000. At these prices there is room for 2,500,000 of them, there being that many farms of 100 or more acres, and these being of the minimum size on which they can be worked efficiently. Farms must be laid out and other operative conditions considered in order to make them paying in any case.

Construction Must Be Rigid

Mr. Rose called attention to the fact that the construction must be rigid to take care of the excessive vibrations to which such vehicles are naturally subjected, and also pointed out that cooling is a problem, large tanks of water being carried in most designs. When asked regarding reference which he had made to the use of rough-cast gears rather than hardened and ground ones, Mr. Rose pointed out that for the large amount of grit and dirt which they catch such gears are just as efficient and cost less than the machined ones. A tractor in farm service travels at the rate of from 2 to 2.25 miles an hour, and hence it stays right in the dirt and dust and does not have a chance to get away as do the faster-moving trucks. For this reason air filters were often employed to keep the dust out of the engine. J. P. Fitzpatrick inquired regarding the feasibility of using worm drive, and Mr. Rose was encouraging on this point. One at least having appeared and looking very attractive it can be worked out undoubtedly.

Henry Souther, ex-president S. A. E. brought up the point as to whether or not a single tractor is likely to be used in a community or by several farmers. Mr. Rose said that it had been mentioned, but that farmers, as a rule, are not easy to organize in that way. In a community

the farmers are all apt to have the same crop and thus the work all comes at the same time, then the farmers all want the tractor at once and they cannot agree as to who is to get it first. It is the same condition as with the threshing machine, every man wants it at the same time.

Herbert Chase, A. C. A., New York, wanted comparative figures as to the total fuel used by the agricultural interests and the automobile industry, and it was thought that there was about as much consumed by automobiles as by agriculture outside of motor vehicles. Regarding air filter and just how serious the dust factor is, Mr. Rose cited one locality in Washington where there is a volcano ash land, and here one concern had to abandon tractor selling due to the dust getting into the cylinders and cutting them out. Rings were worn to mere slivers in another case. Filters usually consist of a disk on the end of the inlet pipe with muslin on either side of it. In another form a special muslin is used with strikers on one side.

Two-wheeled tractors were mentioned and the special advantage of getting into corners with them was cited. They usually are constructed with two large wheels and the motor in between with the plows in the rear.

C. T. Myers also mentioned the light and cheap type of tractors now undergoing development, they drawing considerably upon automobile practice. The vibration trouble he said is similar to that in the early days of the truck, but now the designers make them less rigid so that they will conform to the road.

In the absence of A. R. Miller, of Detroit, K. W. Zimmerschied read the main points of his paper on increasing truck efficiency with trailers. Mr. Zimmerschied also read two dissenting opinions by absentees from the trip. H. D. Church, Packard company, was one of these and he believed that a truck is designed to carry a certain load and not pull several times its capacity. Continual use of its pulling powers brings about many losses and there is not sufficient cooling capacity to pull in hot weather. Traffic conditions and the inadequacy of brakes to handle trailers are also points against their use, according to Mr. Church.

John Younger, Pierce-Arrow, is also against the use of trailers as it increases depreciation, according to his view. He disapproves of rear members of truck frames being standardized in order to make use of trailers.

Automobile Lubrication

Oil was refined in a model refinery by G. W. Stratford, of Pratt & Washburn, refiners, who gave the paper on Automobile Lubrication, as the result of a long and painstaking investigation. H. L. Connell asked regarding oil filters on motors. Mr. Stratford said he has had no experience with oil regeneration, but it is surprising how the color may be brought back by passing the oil through waste. He approves of a settling basin rather than a filtration within the engine.

Henry Souther spoke for the co-operation between the refiners and the users as typified by Mr. Stratford, telling of his experience, he being a refiner. In the old days all was mystery, now we are getting something worth while. He cautioned against laying everything to lubricating oils as being the cause of all ills. There must be some give and take.

Mr. Myers questioned as to what had been learned as to the effects of good and bad mixtures on carbonization. Mr. Stratford said that it is very difficult to determine the amount of carbonization from a poor mixture. Rich mixtures show big increase in carbon deposit and it may vary from less than 1 per cent. to as high as 75 per cent., depending upon how much of the time the explosions are on full throttle opening.

At the start of proceedings on Tuesday morning, President VanDervoort announced that the paper on Tire Inflation would be postponed till tomorrow, the author being absent and expected to come aboard later. Thus the first paper taken was on Spiral Bevel Gears. A. L. Stewart, of the Gleason Works, expounded this very lucidly, using some sketches, and the discussion following was extremely vigorous, centering mainly around the question of durability of tooth form. It was maintained that the permanent pitch line contact in bevel gearing caused wear over face of tooth at an even rate, while in other gear forms, except worm, the pitch line wear is slower than wear at other portions of the tooth face.

A. P. Brush's paper on engine design covered the reasons for many phases of engine design and brought to a head discussion on the merits of the eights and twelves. Discussion on that point has been called for by President VanDervoort and no doubt later in the meeting some valuable discussion will ensue. Mr. Brush's paper brought out much discussion on the merits of eights and twelves and the discussion was handled by such engineers as Huff, Coffin, Dunham, Ferguson and White. It broadly indicated that the question of piston displacement per cylinder is the fundamental factor.

Resta Goes 110.1 M.P.H. on Chicago's 2-Mile Board Speedway

500-Mile Race Postponed to June 26 Because of Strike and Rains—Stutz Cars Average High—All Cars Qualify to Date

CHICAGO, ILL., June 15—*Special Telegram*—The 500-mile race to be held Saturday, June 19, on the new 2-mile wood speedway in this city has been postponed 1 week and will be run Saturday, June 26. Continual rains have placed the infield in such a condition that it is impossible to park cars and the street car strike in the city has made the running of the race practically impossible. Some of the elimination trials have already been made but they will not be completed until June 17.

This was the decision reached late tonight at a conference of the speedway promotors and the race officials, the majority of whom are members of the Chicago Automobile Club and pioneers in the promotion of speed events.

It is believed that the postponement will make for a better race and will increase the attendance. Although the spectators could reach the speedway from the loop district without depending upon the street cars, the traction strike might have an untoward effect on the attendance since the fans would be partially dependent upon the surface and elevated roads to carry them from the residence sections to the terminals of the steam and interurban lines that run to the track. The postponement also will give the infield, now soft and muddy as a result of recent rains, a chance to dry out and thus permit easy parking of cars.

The drivers welcome the postponement as it gives them more time to prepare their cars and allows for more practice. Practice is a profitable proposition here, the pilots receiving 40 per cent. of the gate receipts. Last Sunday, each of the nineteen drivers that appeared on the track received $90 from the management and if this Sunday is fair, the speed stars expect to harvest a greater crop.

CHICAGO, ILL., June 15—*Special Telegram*—With the throttle of his Peugeot wide open and sweeping around the banked turns without decreasing his astounding speed, Dario Resta, winner of the 1915 Vanderbilt and Grand Prize races and second to Ralph De Palma at Indianapolis, May 31, established a world's speedway record for cars of 300 cubic inches piston displacement of 110.1 miles per hour this afternoon in the

elimination trials for the inaugural race to be run on the Chicago board oval Saturday.

Resta's time for the 2-mile lap was 1 minute 5.4 seconds and shatters all existing records for the distance irrespective of piston displacement classification except the 2-mile mark of Jean Chassagne, who last year covered 2 miles on the Brooklands track in 60.51 seconds at the wheel of the twelve-cylinder Sunbeam. Resta's speed today was far greater than that ever reached by a 300-inch car, being 3 miles an hour faster than the world's 1-mile record of 107 miles per hour made by Georges Boillot in a 300-inch Peugeot at Boulogne-Sur-Mer last year.

Before Resta covered his record lap today, Earl Cooper was king of the new wooden track by virtue of a 2-mile drive at a speed of 109.09 miles per hour in practice last Friday.

Stutz Average High

Just as phenomenal as Resta's record lap was the showing of the three Stutz cars in today's elimination trials. All three entries qualified at a speed of 104 miles an hour or better. Cooper turned the fastest lap, his time being 1 minute 8.8 seconds. Gil Anderson's time was 1 minute 8.6 seconds and Howdy Wilcox made the circuit of the bowl in 1 minute 8.7 seconds. Such consistency is truly remarkable, there being but 2-10 second difference in the time of the fastest and the slowest car.

Fifteen Qualify

Fifteen of the twenty-nine entries for the Chicago race qualified today. None of the cars that reported for the tests failed to make a lap at less than an 85-mile an hour average, the speed necessary to start. Besides the Stutz, two other three-car teams qualified all three of their entries, Duesenberg and Maxwell. Two of the Knight-motored F. R. P. cars made their first appearance and escaped elimination.

The cars that have yet to qualify in the elimination trials to be held to-morrow and Thursday are the two Sunbeams driven by Von Raalte and Porporato; Chevrolet's Delage, Babcock's Peugeot, Brown's Du Chesneau, the two Mulford Specials, Henning's Mercer Special, Zucker's Berwyn Baby, Hughes' F. R. P., Joe Cooper's Sebring and Johnny Mais' Mais Special.

The cars that qualified today are:

Car	Driver	Time	M.P.H.
Sunbeam	Harry Grant	1:16	94.75
Peugeot	Bob Burman	1:11:3	101.00
Maxwell	Eddie Rickenbacher	1:14:6	96.55
Peugeot	Dario Resta	1:05:4	110.1
Duesenberg	Willie Haupt	1:17:6	92.65
Duesenberg	Tom Alley	1:15:9	95.00
Duesenberg	Eddie O'Donnell	1:17:6	92.65
F. R. P.	Earl Devore	1:21:3	89.55
Stutz	Howdy Wilcox	1:08:7	104.75
Stutz	Earl Cooper	1:08:8	104.56
F. R. P.	Charles Keene	1:14:3	96.9
Stutz	Gil Anderson	1:08:8	104.6
Maxwell	Tom Orr	1:22:2	87.4
Maxwell	Billy Carlson	1:14:3	96.9
Sunbeam	Limberg	1:19:3	90.8

Motor Troubles Sure, Say Drivers

CHICAGO, ILL., June 15—Drivers in the 500-mile race Saturday prophesy a paradox from their experience on the new track. It seems to be the consensus of opinion that the race on the one hand will be the fastest long distance ever run in America, and on the other that there will be more motor trouble than ever has been experienced in a 500-mile race before.

Ralph DePalma thinks the track is too fast for the cars and that no car in America today will be able to test its possibilities. He expects an unusual amount of engine trouble because there will be no opportunity to close the throttle during the 500 miles. At Indianapolis it has been necessary to close the throttle to take the turns, which temporary rest adds to the life and staying power of the motor, allowing more oil to work up, allowing the engine to cool slightly and also relieving parts from the constant strain of the uninterrupted succession of explosions.

Porporato says that the race will be the easiest on drivers that ever has been run. He finds that the car goes into the turn and holds the turn at whatever level it enters the turn and holds this level clear around the turn, practically without aid of the driver; that little or no steering is necessary to keep the car on its course.

After Cooper had made his record speed of 109 miles an hour, he stated that at no time during the two miles was the throttle closed and added that the sensation of the turns which has been a feature of Indianapolis is eliminated at Chicago. Harry Stutz said it is possible for a car to make 140 miles per hour on the track and Bob Burman believes that were he to put his 200 horsepower Benz on the speedway he easily could make a lap in one minute, which is equal to 120 miles per hour.

A rather unusual prophecy was made by DePalma who said he expected to see a great deal of trouble with wheel bearings. On other courses which are not banked to the degree that the Chicago speedway is sent the pressure on the wheels which is made up of the weight of the car plus the centrifugal force on the turns is divided into two components—one in the direction of the vertical axle of the car; that is, a radial load on the bearings, and the other a side thrust which tends to cause the car to skid. With the banking as it is on the Chicago track, this side thrust is eliminated; that is, there is no skidding tendency.

Gasoline Price War in West

Standard Cuts 1 Cent, but Independents Refuse to Follow —Crenshaw Heads Latter

KANSAS CITY, MO., June 15—What looks like the opening shot in gasoline price warfare, between the Standard Oil interests and the independent operators and refiners, has started here by the Standard Oil Co. reducing price of gasoline 1 cent per gallon, from 9.8 to 8.8 cents, which is the only cut since February 22. Up to the present, local independent refiners have refused to follow this cut and are appealing to their customers to oppose the old rates. Twenty-four refiners representing Western petroleum interests in Kansas and Oklahoma fields, have met in Tulsa, Okla., and have refused to follow the present cut saying that such prices are profitless and that the Standard company would probably advance crude oil and further reduce gasoline. The claim is made in this section that the independent refineries which control much of the mid-continent and Cushing pools are gaining control of the market and that it may be such a condition has prompted the present apparent price war of the Standard company. The independents declare that the present European consumption of gasoline warrants an increase rather than a decrease in the price and that before the end of the year an increase of perhaps 1 cent or a little more may be expected.

The independent refiners are now better organized than previously, due to P. C. Crenshaw, who for 17 years was general manager of the Standard Oil Co. of Indiana, and who resigned in January to take up the problem of fostering better unanimity among the independent refineries. It is understood that Mr. Crenshaw's latest organization, the Home Oil Co., will control a considerable quantity of the independent interests.

Standard Oil's Explanation

The only explanation which has been offered for the cut by the Standard company of 1 cent, is because of the unfavorable weather during the month of May and reductions in the price of crude oil. An independent refiner interested with Mr. Crenshaw, says:

"The crude oil market has remained stationary since February. Notwithstanding this fact the gasoline market has been steadily reduced in the field of the Indiana company so that whereas on January 1 the price at Chicago was 11 cents, it is now 8 cents—either they were charging too much then or too little now. The eastern Standard companies, using the same crude, which is pumped through the pipe lines from the Kansas-Oklahoma fields, have recently advanced their market on gasoline. While business in May fell off materially, previous to that time it had been way ahead of last year and indications are that the gain in volume will be continued."

Service Convention in Detroit

N. A. C. C. Members To Standardize Parts Policy June 28-29

NEW YORK CITY, June 14—A 2-day convention of the heads of the service departments of automobile and truck makers who are members of the National Automobile Chamber of Commerce, Inc., will be held in Detroit, Monday and Tuesday, June 28 and 29, at Hotel Statler. The object of the convention is to draft some definite standard system of factories handling stocks of spare parts with their dealers. One of the abuses that it is hoped to rectify is that of dealers holding stock of parts for several years and then returning them and expecting credits. Some progressive form of parts inventory will have to be worked out. The convention will be called at 10 a.m., June 28, and all of the ninety-seven members of the chamber have been asked to send representatives.

On Wednesday, June 30, the day following the service convention, the meeting of the committee of truck men appointed at the recent truck convention to work on some form of service policy for truck makers will meet at Hotel Statler. Chairman Windsor T. White of the commercial vehicle committee of the N. A. C. C. will preside and the five truck members who are not representatives of the N. A. C. C. who will attend are Victor L. Brown, president Sternberg company, E. T. Birdsall, president Kosmath company, Henry Landale, vice-president Denby company, H. Wilcox, president Wilcox company, and Joseph C. Millman, secretary Stegeman company.

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Studebaker Expands in L. I. City

NEW YORK CITY, June 14—The Studebaker Corp. branch quarters in this city at 56th street and Broadway, have been found inadequate and as a result a new building will be erected at the Degnon Terminal in Long Island City to care for both service and storage. The building will be located on the western side of Anable avenue, south of Meadow street and the Sunnyside yards of the Pennsylvania railroad. It will be of concrete, fireproof, 160 by 80 feet, four stories high, and will be ready for occupancy November 1.

The present home of the company on Broadway will be rearranged for purely retail purposes. The first floor will be devoted to a showroom. Used cars will be exhibited on the second floor. As at present, the general offices will be on the third floor. The fourth floor will have a complete assortment of stock and parts, supplementing the work to be done at Long Island City. The fifth floor will be a salesroom for the light trucks.

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Market Prices Steady

NEW YORK CITY, June 15—Market prices in general were steady last week. Most of the changes were in the metals markets and were all gains. The most important development was the gain of $1.75 per 100 pounds for lead. This metal experienced a gradual rise from $6.00 on Tuesday to $7.75 at the closing on Monday. Tin went up $3.00 per 100 pounds. Yesterday considerable excitement was manifested in the tin market on account of the sudden rise from $40.75 to $42.50. However, there was only a very moderate volume of business transacted. Both Lake and electrolytic coppers were more or less steady throughout the week, the former closing at 20 cents and the latter at 20 3-8.

Fine Up-River Para was a little stronger in tone last week, the price going up 1 cent. A somewhat larger inquiry was noted from the manufacturers, though trading was restricted during the latter part of the week to small quantities. The consumption of rubber in the tire industry is declared to have been heavy in recent weeks.

There was only one change in the oils and lubricants markets, that being in linseed oil, which dropped 3 cents.

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Reo Declares Extra Dividend—Benham Payment

DETROIT, MICH., June 16—*Special Telegram*—The Reo Motor Car Co., Lansing, Mich., has declared its extra dividend of 12.5 per cent., thus making a total cash dividend of 15 per cent., or $450,000.

A similar cash dividend is expected to be announced in October while the Reo Motor Truck Co., it is expected, will announce a cash dividend shortly.

Creditors of the Benham Mfg. Co. will shortly receive a dividend of 10 per cent, amounting to $2,500, according to an order of Referee in Bankruptcy Lee E. Joslyn.

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New Akron Tire Concern

AKRON, O., June 14—Another tire company will make its home in Akron, O. The new concern will be known as the Double Service Tire & Rubber Co. It is incorporated for $50,000. The incorporators are H. F. Guyer, D. T. Bowlus and M. S. Glover.

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Goodrich Output 50 per Cent. Over 1914

AKRON, O., June 14—The B. F. Goodrich Co. has maintained its output of tires during the first 5 months of 1915 at a 50 per cent. increase over the same period during 1914. The company is manufacturing close to 11,000 tires a day, and it is stated that it is unable to take care of orders.

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Detroit May Get 8-Cent Gasoline

DETROIT, MICH., June 11—Gasoline is being sold at 10 cents a gallon here. An official from one of the independent oil stations said that he thought it will be down to 9 1-2 or even 9 cents soon as the wholesale price is likely to be cut to about 8 cents, as against 8.8 cents at present.

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Minneapolis Gasoline Reduced 1 Cent

MINNEAPOLIS, MINN., June 14—Gasoline prices have been reduced by the oil companies 1 cent per gallon on all grades, making the prices 10.5, 13.5, 14.5 and 16.5. The Standard Oil Co. made its reduction June 7 and the independent companies immediately met the cut.

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Briscoe Eight or Four in Same Chassis

JACKSON, MICH., June 12—The Briscoe Motor Co., which will shortly give details as to its new eight- and four-cylinder cars has adopted a policy which will be of decided help to both the dealer and the buyer.

Instead of making two different chassis, one for its eight and the other

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.28	.28	.28	.28	.28	.28	.....
Antimony	.35	.35	.35	.36	.36	.36	+.01
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Copper, Elec., lb.	.19½	.19⅝	.19⅞	.19⅞	.20	.20	+.00½
Copper, Lake, lb.	.19⅝	.19¾	.20	.20	.20¼	.20⅜	+.00¾
Cottonseed Oil, bbl.	6.20	6.17	6.21	6.15	6.15	6.05	+.15
Cyanide Potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish Oil, Menhaden, Brown	.41	.41	.40	.40	.40	.40	—.01
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	6.00	6.25	7.00	7.25	7.38	7.75	+1.75
Linseed Oil	.67	.67	.67	.67	.64	.64	—.03
Open-Hearth Steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.85	.85	.85	.85	.85	.85	.....
Rubber, Fine Up-River, Para	.62	.62	.62	.63	.63	.63	+.01
Silk, raw, Ital.	3.90	..	3.90	..	..	3.90	.....
Silk, raw, Japan	3.32½	..	3.35	..	..	3.35	+.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	39.50	40.25	40.00	40.75	40.75	42.50	+3.00
Tire scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

for its four, the company will sell a chassis which can be fitted with either an eight or a four-cylinder motor.

With the exception of the motors the Briscoe eight and the Briscoe four will be alike in general construction, in fact, it will be possible to transform or change one model to the other within comparatively very short time.

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Paige-Detroit's Monthly Dividend Now 10 Per Cent.

DETROIT, MICH., June 11—The Paige-Detroit Motor Co. has increased its monthly dividend to 10 per cent., and the eighteen stockholders of the company have been paid $25,000 representing the June dividend. This is at the rate of $300,000 for the year or $50,000 more than the concern's total capitalization. It also represents a rate of a 120 per cent. dividend for the year.

In April the company increased its dividend from 4 to 7 per cent. a month.

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25 per Cent. Walpole Dividend

BOSTON, MASS., June 14—The receivers of the Walpole Tire & Rubber Co. have declared an additional dividend of 25 per cent. to the creditors, thus making a total of 50 per cent. to the creditors. Further dividends will be paid, and it is expected that the total will eventually amount to at least 85 per cent. The New York creditors who bought the property were allowed 85 per cent. on their claims in the negotiations with the receivers.

The total receipts since the receivers were appointed, August 3, 1913, up to May 22, 1915, amount to $3,503,887. The total expenditures amount to $3,247,285, leaving a cash balance of $256,602.

Securities Continue To Rise

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Crop Reports and Encouraging News of International Controversy Bring Confidence

NEW YORK CITY, June 14—Resistance to all disquieting influences with a consequent active market, strong tone and higher prices were the dominant features of this week's security quotations. All uncertainty in regard to the controversy with Germany seems to have been cleared away as reflected in the heavy buying by speculative and investment interests. Added to this confidence in the business field is the recent Government report which promised a wheat crop of almost 1,000,000,000 bushels.

At the beginning of the week there was an upward rush. After this a selling movement of considerable moment set in. Some of the issues again displayed advances similar to those which were so frequent during April and May. During the middle of the week up to Friday the market was quieter, the market being governed almost wholly by war developments and by the effect of hostilities on different issues. After Friday, prices picked up and held the advance until Saturday.

This week tire issues again featured the market, most of the stocks showing substantial gains. A few of the automobile securities showed good gains, ranging from 1 to 6 points. In the tire division, Kelly-Springfield showed a very substantial gain, its common rising 16 points, its first preferred 2 1-2 and its second preferred, 10 points. Portage Rubber preferred also showed a large gain of 7 points.

A rumor has been spread from Chicago that steps have been taken to list Ford stock on the Chicago exchange.

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General Rubber Issues $9,000,000 5 Per Cent. Debentures

NEW YORK CITY, June 10—The First National Bank and the Central Trust Co. are receiving subscriptions at 97 3-4 and interest, to yield about 5 3-4 per cent., to the $9,000,000 General Rubber Co. 5 per cent. debentures, which are dated July 1 and which mature December 1, 1918.

The bonds are guaranteed as to principal and interest, jointly and severally by the United States Rubber Co. and the Rubber Goods Mfg. Co.

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Chevrolet Joins Merchants' Association

NEW YORK CITY, June 14—The Chevrolet Motor Co., this city, has been elected a member of the Merchants' Assn. This organization, formed to better business conditions both in this and foreign countries, already has about sixteen automobile firms as members.

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MacManus Co. Changes Name

DETROIT, MICH., June 11—The McManus Co., advertising agency, will hereafter be known as the Power, Alexander & Jenkins Co. The officers are: William S. Power, president; Kirk B. Alexander, vice-president and general manager; W. Haddon Jenkins, Jr., secretary; and Charles E. Will, treasurer. These officers and Louis Ling, Wetmore Hodges and George P. Fletcher are the directors.

Automobile Securities Quotations on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	220	..	300	..	..
Ajax-Grieb Rubber Co. pfd	99	..	101	..	..
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	90	95	..	80	..
Chalmers Motor Company com	99	102	95	97	+6
Chalmers Motor Company pfd	96	99	91	94	—4
Electric Storage Battery Co	52	52½	52	53	+1
Firestone Tire & Rubber Co. com	300	304	484	488	—1
Firestone Tire & Rubber Co. pfd	108	109½	111	..	+1
General Motors Company com	91½	92	152	154	+1
General Motors Company pfd	93	95	100	101	+1
B. F. Goodrich Company com	24¾	25	47	48½	+ ½
B. F. Goodrich Co. pfd	89¾	90½	101¼	102¼	+ ¼
Goodyear Tire & Rubber Co. com	172	176	246	252	+2
Goodyear Tire & Rubber Co. pfd	97½	98½	105	106	— ¼
Gray & Davis, Inc., pfd	95	102½	..	..	..
International Motor Co. com	..	5	14½	15½	+ ½
International Motor Co. pfd	3	10	37	39	..
Kelly-Springfield Tire Co. com	..	..	145	147	+16
Kelly-Springfield Tire Co. 1st pfd	..	..	85½	86	+2½
Kelly-Springfield Tire Co. 2nd pfd	..	..	140	150	+10
Maxwell Motor Company com	14⅝	14⅞	46	47	..
Maxwell Motor Company 1st pfd	44	45	86	87½	—1
Maxwell Motor Company 2nd pfd	18½	19	38	40	+1
Miller Rubber Company com	..	..	185	187	+5
Miller Rubber Company pfd	..	..	104	106	..
New Departure Mfg. Co. com	125	127	..	..	..
New Departure Mfg. Co. pfd	106	107	..	..	..
Packard Motor Car Co. com	103	..	102	104	..
†Packard Motor Car Co. pfd	97	..	96¼	..	..
Peerless Motor Car Co., com	18	25	67	70	..
Peerless Motor Car Co. pfd	..	62½	94	96	..
Portage Rubber Co. com	..	40	35	39	..
Portage Rubber Co. pfd	..	90	92	93	+7
*Reo Motor Truck Co	10	10¾	14⅜	15⅛	— ⅜
*Reo Motor Car Company	19¼	20½	33	33½	+ ¼
Splitdorf Electric Co. pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	47	48½	67½	68½	— ½
Stewart-Warner Speed. Corp. pfd	97½	99	104	106	+1
Studebaker Corporation com	32¾	33½	75	77	+4
Studebaker Corporation pfd	87	88	99	100½	..
Swinehart Tire & Rubber Co	70	80	79	82	—1
Texas Company	146	147	128	130	..
U. S. Rubber Co. com	58½	59	66	68	+1
U. S. Rubber Co. 1st pfd	102⅛	103⅜	107½	109	+1½
Vacuum Oil Company	225	228	201	205	—3
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	77	79	131	132	+1
Willys-Overland Co. pfd	93	95	101½	103	..

*Par value $10, all others $100 par value. †Ex-dividend.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS.

	Bid	Asked	Bid	Asked	Ch'ge
Chalmers Motor Co. com	101	102½	91	95	+3
Chalmers Motor Co. pfd	96½	99	94½	97½	— ½
Continental Motor Co. com	..	180	180	200	..
Continental Motor Co. pfd	..	75	84½	86	..
General Motors Co. com	91	93	150	154	+4
General Motors Co. pfd	93	95	100	101	+1
Maxwell Motor Co. com	14½	15½	45	47	+7
Maxwell Motor Co. 1st pfd	44½	45½	86	88	..
Maxwell Motor Co. 2nd pfd	18	19	38¼	40¼	+ ¼
Packard Motor Car Co. com	103	..	..	104	..
Packard Motor Car Co. pfd	97	100	96¼	99	..
*Reo Motor Car Co	20¼	21¼	..	32¾	— ¾
*Reo Motor Truck Co	10	10¾	14⅜	15⅛	—⅜
Studebaker Corp. com	..	..	75½	77½	+2½
Studebaker Corp. pfd	..	..	..	101	+1

INACTIVE STOCKS.

*Atlas Drop Forge Co	..	21	..	26	..
Ford Motor Co. of Canada	..	550	950	..	..
Kelsey Wheel Co	185	..	200	..	..
*W. K. Pruden Co	..	21½	19½	21	..
Regal Motor Car Co. pfd	20	..	..	25	..

BONDS.

General Motors, notes 6s, 1915	101	102	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

Natalite a Gasoline Substitute

—

Obtained from Waste Products of Sugar—Is Safe Against Fire

LONDON, ENG., June 1—The Royal Automobile Club has been conducting tests with a new fuel, to which the name Natalite has been given. The fuel takes its name from Natal, the country of its origin. It is a mixture, the principal ingredient, alcohol, being obtained from the waste products of sugar refining factories. The cost of extracting the alcohol from the raw material is low.

Natalite has a specific gravity of .800 and a freezing point very much lower than benzol or petrol. In recent tests with a hydro-aeroplane fitted with a 100-horsepower Curtiss engine, it was found that the engine would run at 1,450 r.p.m. on Natalite as against 1,250 r.p.m. with gasoline.

Among other advantages is that of safety against fire, for it is claimed that water will readily extinguish the flames.

It has been a common fault with alcohol and its mixtures that unless the combustion is complete and perfect, corrosion of the cylinders is apparent after prolonged use. To obviate this, there is introduced in Natalite a slight percentage of an alkaline substance to neutralize the acidity which leads to the corrosion. In South Africa, a test car has been running exclusively on this fuel in its perfected state for the last 6 months and more, and no trouble of this nature has made an appearance.

In regard to the question of power, and incidentally the ability to run without altering the carbureter, a test has been made with a 15.9 horsepower Charron. The car, in addition to the main tank, was fitted with a test tank on the dash, feeding the carbureter by gravity, and while 1 liter of gasoline carried the car at a moderate speed for 3.7 miles, a similar quantity of Natalite under the same conditions did 4 miles.

A company has been formed to make the new fuel for commercial purposes and it is expected operations will begin at the end of the present year.

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Chalmers District Managers in Quarterly Session

DETROIT, MICH., June 10—District managers of the Chalmers Motor Co., assembled for their regular quarterly convention June 7 to 9. Those present were: C. E. Thompson, F. B. Willis and J. A. Wilson, from the Eastern district; L. F. Johnson, Atlanta district; W. W. Morris, Jr., and J. A. Nelson, Kansas City district; L. L. Brockett and E. W. Nicholson, Minneapolis district; C. H. Booth and J. D. Castlow, Detroit district; C. V. Beck and H. H. W. Mackie, Chicago district. Vice-president and works manager S. H. Humphrey took the salesmen through the factory where they were given information on 1916 cars.

There were business sessions almost without interruption all day Tuesday, June 8, the principal being a talk about the new Chalmers motor, by chief engineer C. C. Hinkley. In the evening President Hugh Chalmers presided at a dinner at the Detroit Athletic Club.

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Great Smith Investors Get $15,000

GRAND RAPIDS, MICH., June 15—Local investors in the Great Smith Automobile Co. have received $15,000 as salvage from the wreck of the concern. Local investors bought a controlling interest in the company for $50,000 and then subscribed $73,150 additional as new capital to place the company on its feet. Then the company went into the hands of a receiver. The $50,000 was lost in the wreck but court litigation established that the $73,150 was in the nature of a loan, no stock having been issued to cover it, and that those who had advanced it should participate as creditors in the distribution of dividends.

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Eccleston Retires—Jarrard Now Handles Apperson Sales

KOKOMO, IND., June 12—J. B. Eccleston, who has been sales manager of Apperson Bros. Automobile Co., since September 1, has retired and this work has been taken up by T. E. Jarrard, vice-president of the organization, who will have assisting him J. H. Newmark, who, in connection with his new sales work, will continue to handle the advertising.

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Sterling Car on Road

BROCKTON, MASS., June 12—The first model of the Sterling car built by the Sterling Motor Car Co., this city, is now on the road undergoing tests. The plans have been changed on the price and equipment, and it is now arranged to build a runabout that will retail for about $800. It is expected that deliveries will be made in September.

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Carl H. Page Completes Staff

NEW YORK CITY, June 10—The Carl H. Page Motors Co., Mitchell agent in this city, has completed its executive and sales staff as follows: Carl H. Page, president; G. W. Hipple, first vice-president and general manager; R. D. Willard, second vice-president; D. A. Young, treasurer; H. B. Leary, secretary; W. H. Van Deusen, director of wholesale sales; J. H. Johnson, general retail sales manager; J. A. Clark, Metropolitan sales manager; Wallace Owen, manager of exchange car department, and Al Camacho, manager of the service department.

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Lancia Imports Not Halted by the War

NEW YORK CITY, June 12—Adams & Montant, the exclusive agents for the Lancia car, in the United States and Canada, have made special arrangement with the Italian Government for the delivery of 35-horsepower chassis, regardless of war conditions in Europe.

Although several of the Italian automobile manufacturers have turned their attention to the manufacture of trucks for the government and have halted the manufacture of passenger cars, a few of them are still continuing in the latter work. The American agents have been receiving within the last month, shipments of from fourteen to eighteen cars a week. They state that in a short time shipments will come in at the rate of about ten cars a month.

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Poole Returns from Europe

NEW YORK CITY, June 12—J. L. Poole, export manager for the Hupp Motor Car Co., Detroit, Mich., returned today from Liverpool on the American liner St. Paul.

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New Building for Pope Parts

HARTFORD, CONN., June 12—Ground was broken this week on the site of a three-story factory building 200 by 55 feet by the Hartford Motor Car Co. and the Walker & Barkman Mfg. Co. W. C. and C. E. Walker and Ralph M. Barkman make up the personnel of each organization, the Hartford Motor Car Co. having the Dodge agency and the Walker & Barkman company, the parts making business acquired from the Pope company. The first floor of the new structure will be utilized by the Hartford Motor Car Co. as a service station. The Walker & Barkman company will utilize the balance of the building in making Pope-Hartford car parts.

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May Sell Pope Westfield Plant

BOSTON, MASS., June 15—The sale of the Westfield plant of the Pope Mfg. Co. to a syndicate, said to contain a number of the Boston noteholders of the Pope company, is expected to result from a hearing before Judge Aldrich of the United States district court in Boston on June 18.

The Massachusetts receivers, Colonel George Pope, C. A. Morse and C. A. Persons, state that they cannot continue the operation of the plant economically. The plant is inventoried at approximately $1,000,000.

Wisconsin Has 66,745 Cars

Total Registrations for 1915 May Reach 75,000—Present Figures Exceed 1914 Mark

MILWAUKEE, WIS., June 14—Wisconsin's total motor car registration by private owners reached 66,745 on June 12, adding further strength to the belief that the total registration for 1915 will total 75,000. Although it is the middle of June, applications for licenses are coming into the secretary of state's office at Madison, Wis., at the rate of 300 a day. The 1914 registration by private owners totalled 53,161 and therefore the present year's registry already shows a gain of more than 13,500. It is figured that the total gain for the year will be 20,000, thus leaving only 6,500 licenses to be issued before December 31.

For the benefit of those desiring the list of registrations, the secretary of state is again publishing the licenses in pamphlet form in series. These lists give the name, address and name of car. A charge of $10 is made for the entire series and no single pamphlets or partial lists are sold. The sale of the lists is in the hands of the superintendent of public property, state capitol, Madison. At present there are ready lists numbering 36,000 licensees, and a book containing the licenses numbered 36,001 to 60,999 is in the hands of the printers. There is a heavy demand for the series by supply manufacturers, dealers, accessory people, car builders and other tradesmen.

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Every Sixth Farmer in West Virginia Owns an Automobile

WHEELING, W. VA., June 12—It is estimated that about every sixth farmer in West Virginia is an automobile owner. There are few progressive farmers in this state who do not have an automobile, and some of them have two or three, for business or pleasure. That is, many of them who collect and bring produce to market, especially butter and eggs, have discarded the horse and are using the motor-driven vehicle.

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Illinois Registrations May Exceed 150,000

SPRINGFIELD, ILL., June 11—Because of a 71 per cent increase in the amount of business handled by the automobile license department of the secretary of state's office, the legislature has increased the appropriation to $145,000, an increase of $15,000. So far this year, 145,000 licenses have been issued as compared with 135,000 in the same period last year. Indications point to a figure exceeding 150,000 for the year. Secretary Stevenson states that the additional appropriation will enable the department to examine each chauffeur individually as provided by law. Beginning next year, each chauffeur will be required to take an oral, written and road examination under the supervision of a state examiner. The secretary also announced that the size of license plates would be reduced one-fourth, thus effecting a large saving in the cost of manufacture.

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144,750 Automobiles and 1,400 Dealers Registered in Ohio

COLUMBUS, O., June 11—According to a report of Ohio Registrar of Automobiles W. H. Walker, up to June 2 there were 144,750 automobiles registered in the Buckeye State. That number exceeds by more than 22,000 the total registration in the state for 1914. It is estimated that 175,000 cars will be registered by the department. Chauffeurs to the number of 1,200 have been registered.

Dealers and manufacturers to the number of 1,400 have been registered. The total receipts of the office up to June 2 were approximately $820,000.

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Ontario Registrations Over 28,000

TORONTO, ONT., June 10—At the close of last year the total number of licenses issued was 31,700, of which 25,300 were for cars owned in Ontario, and 6,400 for outside cars. Up to the present or for the first 5 months of this year 28,000 odd licenses have been taken out by Ontario owners, and 3,000 by outsiders. An increase of 3,000 cars in the province, with additions for 7 months to come, is enough to convince the pessimistic that there is still a measure of prosperity in Ontario.

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Baltimore Bars Headlight Glare

BALTIMORE, MD., June 12—Motorists who enter Baltimore July 1 or after should know that the law requiring the dimming of headlights will be in effect at that time. They are: Headlights must be extinguished on entering the city limits, and the front glass, or lens, of the headlight can be covered with any substance or material, or treated in any manner that will eliminate the transparency of the front glass or lens.

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73,300 Cars in Minnesota

MINNEAPOLIS, MINN., June 14—There are 73,300 automobiles and about 10,000 motorcycles in Minnesota, according to license records. Last month 7,995 automobiles were licensed.

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California May Fees $2,418,000

SACRAMENTO, CAL., June 7—During May 2,418 new cars were sold in California, the average price being $1,000, according to statistics given out by the state motor vehicle department. Fees received during that month totaled $2,418,000.

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Michigan Registrations Pass 90,000 Mark

LANSING, MICH., June 12—Up to the end of May over 90,000 automobile licenses had been issued by the secretary of state. This is an increase of over 15,000 as compared with the total number issued for all of 1914. At the rate the registration numbers have been going, it will not be surprising if at the end of the year 120,000 cars will have been licensed in the State of Michigan, as compared with 76,389 in 1914.

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68,180 Licenses in N. J.

TRENTON, N. J., June 12—An unprecedented increase in the business of the State Motor Vehicle Dept. is shown in a statement issued by Commissioner W. L. Dill today. From January 1 to May 31 there were 13,247 examinations. During the corresponding period last year the total number of examinations was 8,543.

For the first 5 months of this year 68,180 drivers' licenses have been issued. Up to June 1 the receipts of the department amounted to $777,700. The total receipts last year were only $814,535.

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2 Years for Car Theft

KANSAS CITY, MO., June 11—Lawrence Noggle, a young man suspected of many thefts of motor cars and accessories in this city, was recently sent to the penitentiary for 2 years.

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Stearns New York Manager Killed

NEW YORK CITY, June 16—William Arthur Lesser, manager of the New York Stearns branch, died here today as the result of an accident near Stroudsburg, Pa., on Sunday. When crossing a bridge over a railroad the side of the road gave way, letting the car drop over onto the tracks and crushing Mr. Lesser. His friend, Louis Levy, riding with him, was killed. Mr. Lesser had been manager of the Stearns branch since January 1, 1911.

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Gray & Davis Quarterly Dividend

BOSTON, MASS., June 14—Gray & Davis, Inc., quarterly dividend 1 3-4 per cent. preferred stock, payable July 1, 1915, to stockholders of record June 24, 1915.

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485 Carloads in 576 Go Out

MINNEAPOLIS, MINN., June 14—There were 485 freight cars of automobiles received at Minneapolis during May and 576 carloads shipped out. These figures were compiled by the traffic division of the Minneapolis Civic & Commerce Assn.

Duesenbergs Star at Galesburg

Take First Three Places in 100-Mile Race—Time for Mile, 1:36

GALESBURG, ILL., June 9—Easily the class of the field of eleven starters, a trio of Duesenberg cars, driven by Eddie O'Donnell, Tom Alley and Billy Chandler, ran one, two, three in the 100-mile race run on the local 1-mile track here this afternoon and captured $2,500 of the $3,000 in prize money hung up for the event.

Two other cars finished inside the money, Joseph Cooper's Sebring and W. W. Brown's Du Chesneau which took fourth and fifth places respectively. The Sebring also uses a Duesenberg motor.

The five cars that split the purse did not stop during the races. The Duesenbergs had too much speed for their rivals and won as they pleased, O'Donnell going to the front at the start and maintaining the lead for the entire distance. Tom Alley gave the pacemaker a challenge all the way and the race developed into a profitable family quarrel.

In winning the race, O'Donnell covered the 100 miles in 1 hour 36 minutes and 3-5 second, an average of 62.5 miles an hour and 3 minutes slower than the time of Ralph Mulford last year. Duesenberg, Alley, 1:36:05; Duesenberg, Chandler, 1:39:30; Sebring, J. Cooper, 1:40:01 3-5; Du Chesneau, Brown, 1:46:22 4-5.

The other cars included a Velie, an Apperson, the Mais Special, the Crown Special, the Bals Special and Andrew Burt's Stutz. A crowd of about 10,000 persons witnessed the race and $8,000 was taken in at the gate.

$5,000 Purse Guaranteed for Arizona Grand Prix

PHOENIX, ARIZ., June 13—*Special Telegram*—The State Fair Commission has guaranteed a $5,000 purse for the Arizona Grand Prix 150-mile race. This will be run over a mile oval dirt track on November 18. G. P. Bullard, superintendent of the race, hopes to have the road races from Los Angeles, Prescott and El Paso end in Phoenix about November 15 when the annual fair opens.

Oldfield Wars on Outlaws

CHICAGO, ILL., June 11—Barney Oldfield has declared war on the International Motor Contest Assn., the organization formed by the state and county fair managers to promote automobile races in connection with the fall fairs. The veteran driver signed a contract to appear at the Nebraska state fair with DeLloyd Thompson, the aviator, from September 6 to 10. The promoters attached a clause to the original document to the effect that Oldfield was to appear in competition should automobile races be run. Barney, in a letter, agreed to this provided the meet was held under the sanction of the A. A. A. contest board. The Nebraska fair managers have signed up the Moross and Sloan teams, now under suspension for participating in the outlaw meet at Detroit last month, for the September dates and have notified Oldfield that he is expected to drive against Disbrow, Hearne, Raimey, Endicott and the other blacklisted pilots. Oldfield has informed the promoters that he will not compete in the meet and the fair managers now threaten him with a suit for breach of contract. Oldfield is going to fight the case and announces that he will remain loyal to the A. A. A. at any sacrifice.

Owen Magnetic Averages 34.1 M.P.H. for 1,935 Miles

NEW YORK CITY, June 10—W. V. R. Whitall yesterday completed a 1,935.6 mile trip in his Owen Magnetic car to Indianapolis and return, making the trip in 56 3-4 hours, or an average of 34.1 miles per hour. For the total mileage of 2,135.6 miles, 200 miles having been driven in and around Indianapolis, the car used 180.2 gallons of gasoline, averaging 12.8 miles per gallon. Five gallons of oil were used, or an average of 427 miles per gallon.

Myers General Manager Indianapolis Speedway

INDIANAPOLIS, IND., June 11—T. E. Myers has been made general manager of the Indianapolis motor speedway. Mr. Myers has for some time been fulfilling the duties of management for the speedway, without, however, receiving public recognition for his work. This has now been given him by official action of the board of directors, Newby, Fisher, Wheeler, and Allison. C. C. Fisher, president of the speedway, however, will continue in active control of the speedway's affairs.

Twin City Speedway Opens Offices

MINNEAPOLIS, MINN., June 14—The Twin City Motor Speedway Co. has opened city offices at 217 Seventh street south, Minneapolis, and at Hotel St. Paul in St. Paul. Dr. C. E. Dutton has been made secretary and manager. Last week a contract for 30,000 barrels of cement was placed and work will soon begin on the 2-mile cement track, as well as on the seven grandstands.

Cole 8 Averages 16.2 M.P.G.

INDIANAPOLIS, IND., June 11—A Cole 8 in a recent unofficial fuel economy test in the streets of this city, showed an average of 16.2 m.p.g.

Romano Wins on Seattle Track

Eight-Cylinder Makes Clean Sweep — Breaks Track Record for Mile

SEATTLE, WASH., June 14—The eight-cylinder Romano car, equipped with a Curtiss aeroplane motor, and driven by Rae Lentz, starred at the meet held on the 1-2-mile track at Madison Park, June 12 and 13, by winning every event in which it was entered.

In a 1-mile trial against time, the Romano made the distance in 1:03 3-5, the best time made on a 1-2-mile track. This same car last June broke the world's record for 25 miles at Portland by making the distance in 22:07 1-2. This time, however, was bettered later by Burman in a Peugeot when he drove the distance at Springfield, Ill., October 22, in 21:37:6.

The Romano has made a clean sweep in all of the events held this year on the Pacific Coast.

The Seattle meet ends the season for the Northwest Automobile Assn. racing campaign. The attendance at each of the 2-day events was about 5,000.

Motorists Defeat Athletes

CHICAGO, ILL., June 12—The Chicago Automobile Club won by a wide margin over the Chicago Athletic Assn. in the interclub reliability run to Fort Wayne and return yesterday and today between teams representing the two organizations. The Automobile club with seventeen cars acquired a total penalization of 207 points for work done and lateness at control and credits for perfect scores amounting to 65 points. The Chicago Athletic Assn. with ten starters was penalized 485 points for work done on the cars and lateness at controls and had a credit of 15 points for perfect scores. The 2-day run was the eighth annual interclub match between the two organizations.

National Used Car Report

CHICAGO, ILL., June 14—The Chicago Automobile Trade Association has just issued its used car market report in national form. It is now called the National Used Car Market Report instead of Central Used Car Market Report. An idea of the number of different models of cars turned out since about 1910 and in the hands of owners is gained from a compilation of the statistics in the book. It lists 2,903 gasoline and steam models and 388 electric, a total of 3,291.

The report—of which this is the fifth edition—covers 131 makes of gasoline car and fourteen electrics and contains data applicable to forty-one of the forty-eight states in the union. It is now 9 x 12 in-

stead of 8 x 10, its former size, and has 119 pages.

Any factory or dealer association which subscribes for a dozen or more reports gets them at one-half the $24-a-year rate. The fourth edition was so subscribed to by Chalmers, Franklin, Packard, Pierce-Arrow, White and Winton. To this has been added for the fifth edition: Chandler, Oldsmobile, Overland and Studebaker.

The list of cars priced has been 131 gasoline and 14 electrics in the last two editions, this list being quite complete. In most cases the listings run back to and including 1910, although earlier models are reported where sales are made.

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Buick Discontinues New England Branch

BOSTON, June 14—The Noyes-Buick Co. was formed last week to take over the wholesale distribution of the Buick for New England instead of having the factory handle it and has been incorporated for $250,000 with Harry Noyes as president and treasurer, and R. L. Nichols, secretary. Mr. Noyes has handled the Buick in this territory for many years. Frederick E. Nichols, formerly with Chalmers, and later New England traveling representative of the Hupp has joined the organization.

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Cadillac Makes San Francisco to Los Angeles in 12 Hours 10 Minutes

SAN FRANCISCO, CAL., June 15—A Cadillac eight recently established a record of 12 hours and 10 minutes between Los Angeles and San Francisco, a distance of 491 1-10 miles. The car was driven by T. J. Beaudet and William Bramlett with E. T. McConners and Arthur Austria as passengers. The car was a regulation stock model, the only preparation being made for the trip was the removal of the top, placing an extra brace on the demountable rim. No extra water, oil or fuel was carried.

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Des Moines Speedway Work Started

DES MOINES, IA., June 10—Construction work has begun on the Des Moines speedway west of the city. The 1-mile course will be made of 103 miles of 2 by 4 timbers placed on edge. The track is to be completed for a tryout by Barney Oldfield on July 25, and a race meet will be held on the speedway at a later date.

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Uniontown Hill Climb June 24

UNIONTOWN, PA., June 12—The third annual hill climb over the 3-mile road from Hopwood to the Summit of Chestnut Ridge will be held Thursday, June 24, at 1 p.m. A total of $2,500 prize money is offered, $1,600 of which goes in the free-for-all event. The climb is 1 mile east of here and is over a concrete road, the average grade of which is 7.754 per cent. The run is under A. A. A. sanction.

800 Buick Dealers Visit Plant

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137 from Wisconsin and 150 from Minnesota, the Dakotas and Montana

MILWAUKEE, WIS., June 12—M. J. Monson, manager of the Milwaukee Buick branch, entertained the company's 137 Wisconsin dealers for a full day at Milwaukee and then escorted the party to Chicago, where 400 to 500 other Buick agents joined them for a trip to the Buick factory. The Wisconsin agents were tendered a banquet at Hotel Martin by Mr. Monson, at which the 1916 Buick policy of six-cylinder cars only was outlined as a preface to the inspection of the new models at the shops. Over 800 dealers have visited the plant since June 7.

MINNEAPOLIS, MINN., June 12—After 1 week aboard a special North Western railroad train of steel sleeping cars 150 dealers in Buick motor cars returned Sunday night from Flint and Detroit, Mich. They left 7 days before as guests of the Pence Automobile Co. of Minneapolis. They were from Minnesota, the Dakotas and Montana. From the time they left the Great Northern station until they were set down again the dealers were guests of the Pence company. They ate, slept and lived in the new palatial steel cars of the railroad company. At the end of the train was the special car carrying Harry E. Pence, the moving genius back of this third annual event for Northwestern Buick dealers, and W. R. Stephens, who has charge of country sales. It was the second trip to the factory, the intervening event being a dinner in Minneapolis last year. Monday was spent in Chicago, the next 3 days in Flint, Friday in Detroit and Saturday in Chicago again.

The announcement was made on the trip that the Pence company will sell 4,500 Buick 1916 models, as compared with 3,000 this year.

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Wisconsin Dealers Active

MILWAUKEE, WIS., June 12—June is proving an unusually active month with Wisconsin dealers. The Cole Motor Co., Indianapolis, Ind., has leased the new garage now being erected at 485-487 Jefferson street, Milwaukee, Wis., as a permanent home for its Milwaukee branch, which was established 2 years ago, and has had temporary quarters at 188-190 Eighth street ever since.

The Wisconsin-Oakland Co., of this city, organized last week with $100,000 capital by the Hokanson and Miller interests of Madison, Wis., to take the agency for the Oakland for Wisconsin, Upper Michigan and parts of Illinois, Iowa and Minnesota, has leased the big garage at 239-241 Wisconsin street, as general headquarters and executive offices. Agency contracts are now being made and the Milwaukee city and county distribution has been placed in the hands of the Milwaukee Motor Sales Co.

The Milwaukee branch of the Ford Motor Co. on Saturday, June 12, tendered a full day's outing at Waukesha beach to the 250 employees of the Ford branch service station and assembling plant. This was the first annual outing and next year the number of participants will be increased by 400 to 500 because of the establishment of a permanent assembling plant in Milwaukee.

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King Dealers Drive Away Ninety Eight-Cylinder Cars

DETROIT, MICH., June 10—Today was drive-away day at the plant of the King Motor Car Co. Dealers and over 100 distributors from Michigan, Indiana, Ohio, Illinois, western New York and western Pennsylvania, were here and drove ninety eight-cylinder cars away from the factory.

Merritt & Seidner, Cleveland distributors, were given the first prize for being the distributors taking along with them the largest number of cars, the total being twenty-eight.

They were taken through the plant during the morning under the direction of chief engineer T. P. Chase. A dinner was given to the dealers at the Fellowcraft club in the evening. Artemas Ward, Sr., principal stockholder of the King company, was toastmaster.

Announcement was made that from now on when the King company will bring out new models at lower prices than previous models, or, if a reduction in prices is announced, dealers and distributors will be given a rebate on whatever number of cars they have in stock from the number they had ordered thirty days previous to the announcement of the new prices.

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Dodge Has Drive-Away Day

DETROIT, MICH., June 15—Twenty-one dealers and customers of Dodge Bros. visited the factory on June 10 and took away with them thirteen cars. All of them are New York State men.

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New Chalmers Distributor in Toledo

TOLEDO, O., June 14—The Chalmers Motor Co., Detroit, has appointed the Cornelius-Browning Co. as a general distributor in northwestern Ohio and southern Michigan.

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Is Abbott and Marion Export Agent

NEW YORK CITY, June 14—The Pullman Sales Co., Broadway and 54th street, has been appointed eastern distributor and export agent for the Abbott and Marion.

Remy Ignition System for Twelves

Uses Hexagonal Cam and Two Breakers—Stromberg Upheld—New Pullman

ANDERSON, IND., June 14—Closely following the announcement of twelve-cylinder cars by some of the leading companies comes a twelve-cylinder battery igniter by the Remy Electric Co. In design this follows the four-, six- and eight-cylinder Remy models but differs in one important respect. Instead of using a cam with the same number of points as sparks required, a hexagonal cam is used and the twelve sparks are obtained by fitting two breakers, one on either side of it. One of these breakers is mounted on a large steel plate which is concentric with the center line of the distributer and has a boss around the hole in the center that the distributer shaft passes through. The second breaker is mounted on a smaller steel plate which is so arranged that when moved all of its parts move in concentric circles above the center line of the distributer. This arrangement insures absolute synchronism in the adjustment of the two breakers. The breaker arms are light to give fast, smooth operation and the fiber block riveted to the center which rides on the cam, is held against it by the use of stiff flat double-leaf springs.

Either manual or automatic spark advance or both are possible with this distributer. A safety spark gap is incorporated in the distributer segment arm. In outer appearance it differs little from other Remy models being provided with the same type of snap-on cover, with the twelve terminals arranged in a circle on the top. A grease cup is provided for lubrication of the distributer shaft bearing.

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Stromberg Patents Sustained

NEW YORK, June 11.—Validity of the Ahara patent on carbureter construction, which has been the subject of litigation for some time, was confirmed this week by Judge Hand in the United States district court for the southern district of New York. The decision is the outcome of a suit brought by Stromberg Motor Devices Co. against officials of the Longuemare Carbureter Co. In confirming the validity of the Ahara patent, Judge Hand declared the Longuemare carbureter an infringement of four claims of this patent which is owned by the Stromberg company. The Richard's patent, also held by the Stromberg company, also was passed on by the court which declared that the parts of this patent infringed by the Longuemare carbureter also were present in the Ahara device. For this reason the suit as applied by the Richard patent was ordered dismissed.

Judge Hand in his decision alludes to that of Judge Sanborn in the Chicago district court in the case of Stromberg vs. Zenith and the John A. Bender Co., relating to alleged infringements of the same patent. It is Judge Hand's opinion that the defendant's argument that the Ahara patent should be limited to a hit-and-miss engine does not hold, even though the patent application would indicate such an engine. It is held that the Longuemare carbureter obtains the same results as that of the Ahara design by exactly the same method of controlling the flow of fuel.

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Pullman Receiver Dismissed

YORK, PA., June 15—The Creditors Committee which has had charge of the affairs of the Pullman Motor Car Co., of this place, for nearly a year, was dismissed on June 1 and the company is again under the control and direction of its stockholders. The management will remain the same.

The company has decided upon its 1916 program of cars and will produce a five-passenger, Clover-Leaf roadster and two-passenger roadster to list at $740. The car will have a wheelbase 4 inches longer than at present, will use Dixie magneto, leather trimmings and 31 by 4 inch tires. The company also contemplates building a $700 delivery car and later a three-passenger coupé, the coupé using the Cutler-Hammer magnetic gearshift, and listing at $990.

In connection with its new policy a convention of distributors was recently held at the factory, seventy-five attending.

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Paterson Cuts Price $100

DETROIT, MICH., June 16—The W. A Paterson Co., Flint, Mich., will continue its model Four-32 for next year and this model will be sold at $100 less than during the present year, the new price being $995. The car will be practically the same in general construction as the present except that it will have a more roomy body for five passengers and will have other improvements. The company states that it will not bring out an eight-cylinder model as has been rumored.

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Bosch for Jeffery and Marmon

NEW YORK CITY, June 16—The Thos. B. Jeffery Co. will use Bosch magnetos as standard on its 1916 cars and trucks. The Nordyke & Marmon Co. has also contracted for Bosch ignition, lighting and starting systems on its 1916 line.

R.R. Protests Truck Competition

Asks Relief from Long and Short-Haul Law—Wants To Reduce Rates

LOUISVILLE, KY., June 10—For the first time in Kentucky automobile traffic coming in competition with a railroad line has caused the railroad to ask relief from the operation of the long and short-haul law. The complainant is the Cincinnati, Flemingsburg & Southeastern Railway Co., which runs from Flemingsburg to Johnson, where it connects with the Louisville & Nashville, and all its business originates in or is consigned to Flemingsburg.

Its rates are based on the regular distance tariffs on the Louisville & Nashville, while an automobile truck with a capacity of 3,000 pounds makes daily trips over the pike between Flemingsburg and Maysville, 17 miles, which latter city has been relieved from the long and short-haul law and has river rates; so that the road complains much traffic that otherwise would go to it goes to Maysville and thence is hauled overland, the motor truck charging only 8 cents per 100 for full loads of freight and 12 1-2 cents for light bulky articles that would take first-class rates by rail.

The complaint points out that the motor truck is not under control of the Railroad Commission and has no franchise to be assessed; it pays a license of $10 for a hack line and an automobile license and will be taxed only at the usual valuation for such property; wherefore it prays permission to reduce rates from points on connecting lines to Flemingsburg sufficiently to meet the competition.

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Gasolock Sales Co. Organized

DETROIT, MICH., June 12—The Gasolock Sales Co. has been organized and incorporated, being capitalized at $5,000. This company will now act as a selling agent for the Gasolock Specialty Co., which manufactures the gasolock and other automobile specialties. The incorporators are: Charles R. Chisholm, president and treasurer; Robert G. Clark, vice-president and secretary; Roy B. Johnston. There are now between 3,500 and 4,000 Gasolocks in use on cars which are operated in Detroit. The Michigan business has been increasing with such rapidity lately that it was found advisable to form a separate selling company.

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Is Paige Distributor in Northwest

SEATTLE, WASH., June 10—Owen McCusker, Jr., Seattle, is distributor and district manager for the Paige company in charge of its interests in Washington, Oregon and Idaho.

Factory Miscellany

Ajax-Grieb to Add — The Ajax-Grieb Rubber Co., Brennig avenue, Trenton, N. J., is taking bids for the erection of a one-story addition to its rubber factory, 28 by 88 ft.

Independence Co. to Move Plant—The Independence Motor Car Co., Lima, O., will move its plant from Lima to Atlanta, Ga., and will establish a new factory. W. A. Williams is manager.

Pneumatic Tire Co. Incorporated—The Pneumatic Tire Co. is the name of a $100,000 corporation chartered under the laws of Kentucky which will establish a tire factory at Madisonville, a suburb of Cincinnati, O.

Weber Implement Adds.—The Weber Implement and Automobile Co., St. Louis, Mo., has begun the erection of a large four-story addition to its building at 1900 Locust street, extending the present structure to Olive street. The addition will be of reinforced concrete.

Haywood Tire Adds — The Haywood Tire & Equipment Co., Indianapolis, Ind., has acquired the building adjoining its present location on North Capitol avenue, and is fitting same up for immediate occupancy. The new building will give the company 10,000 square feet additional floor space.

Toledo Home for Harvester Co.—A $100,000 home for the International Harvester Co. will be constructed at Hamilton and Erie streets, Toledo, O., where the motor trucks manufactured by the company will be sold. One of the features of the building will be a display room and a tractor shed for the demonstration of tractors. The work of construction will be undertaken at once.

Goodyear Buys Site.—The Goodyear Tire & Rubber Co. has bought a 2-acre tract of land near the Belt Line Railroad with a frontage of 600 feet on River street. A three-story brick building, 25 by 125 feet, will be erected on the site. The building will be an addition to the core tire department and will have a floor space of 37,000 feet. The company is employing 7,500 men. The Goodyear buildings combined will have a floor space of 2,000,000 feet.

Los Angeles Electric Co. Moves—The Los Angeles Ignition Works has moved to its new locations, 1007-1011 South Main street and 1006-1010 South Broadway, Los Angeles, Cal., where it has one of the best-equipped electrical automobile plants in the state. The salesrooms, battery-charging plant, magneto and coil shop and general electrical repair shop are so well apportioned that all classes of automobile electrical work can be done scientifically and without delay to customers.

Puritan Machine Buys Property—The Puritan Machine Co., Lafayette boulevard and Tenth street, Detroit, Mich., dealer in automobile parts, has purchased the property at 432 Lafayette boulevard and will erect thereon a large addition to its present quarters. The company has added two floors to this plant and has made arrangements for the construction of a large 5-story warehouse on property adjacent to the main building. The company has purchased outright the service and repair parts of sixty-one makes of automobiles not now manufactured.

Gulf Refining's $750,000 Plant—One of the largest oil mixing plants in the country is nearing completion in Lynchburg, Texas, by the Gulf Refining Co. The different departments and buildings of the concern are built upon the unit system with the view of adding to the plant as the demands of the business may require. The cost of the new plant up to this time is approximately $750,000. In connection with the industrial works the company is making extensive improvements to deep-water and pipeline terminal facilities here. It is reported that it will obtain much of its crude oil supply from the Tampico (Mexico) fields. Its first tank steamer is due to arrive here the latter part of the month.

Working on Ford's Milwaukee Plant—Construction work is now well under way on the new Milwaukee branch plant of the Ford Motor Co. at Prospect avenue and Kenilworth place and the Northwestern tracks. Complete plans for the structure have been filed with the building inspector's department and show ground dimensions of 300 feet on Prospect avenue, 120 feet on Kenilworth place and 150 feet on the Northwestern line. The structure will be of reinforced concrete and steel, five stories high, with a deep basement. The site affords room for a duplicate of the building now projected. The building alone will cost $250,000 and the equipment an additional $150,000. The plant is to be ready for business by November 15 or December 1 and will employ 400 to 500 men.

The Automobile Calendar

June 14-17.....Detroit, Mich., Summer Meeting of the Society of Automobile Engineers and Start of Cruise to Georgian Bay.
June 15.....Peoria, Ill., Track Race, 100 Miles, National Implement and Vehicle Show.
June 15-17.....Chambersburg, Pa., Run to Atlantic City.
June 26.....Chicago, Ill., 500-Mile Race, Chicago Speedway.
July 3.....Utica, N. Y., Hill Climb, Automobile Club of Utica.
July 3.....Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 4.....Visalia, Cal., Road Race; Tulare County Automobile Assn.
July 4-5.....Tacoma, Wash., Road Race, Tacoma Speedway Assn.
July 5.....Omaha, Neb., Speedway Races, Omaha Motor Speedway.
July 5.....Visalia, Cal., Road Race, Tulare Co. Auto. Assn.
July 7-8.....Taylor, Texas, Track Race, Taylor Automobile Club.
July 9.....Burlington, Ia., 100-Mile Track Race; Tri-State Fair.
Aug.....Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3.....San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21.....Elgin, Ill., Road Races.
Sept.....Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept.....Peoria, Ill., Second Northwestern Road Congress.
Sept. 6.....Providence, R. I., Speedway Race; F. E. Perkins.
Sept. 6.....Detroit, Mich., Speedway Race; Detroit Speedway Club.
Sept. 8-11.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Oct.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 1.....Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Nov. 18.....Arizona 150-mile Grand Prix.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Steiner, St. Louis, Velie Mgr.—Alex. Steiner has taken charge as manager of the Velie Motor Co. of St. Louis, Mo. He succeeds W. A. Gray, who resigned.

Kroh Now Sells Appersons—H. A. Kroh, formerly New England representative of the Continental Asbestos Corp., with headquarters at Boston, Mass., has resigned to accept a position with the Brown-Apperson Co., New England distributor for the Apperson line.

Henderson Goes to Bath—C. T. Henderson, formerly manager of the Skowhegan, Me., Garage, has gone to Bath, and with J. F. McCole has leased the Washburn garage on Broad and Commercial streets. Mr. Henderson will have charge of the mechanical department.

Hall Gets More Territory—Sherwood Hall, Jr., who has the agency for the Paige Detroit in Boston, Mass., has secured more territory from the factory, and now he has Cheshire, Rockingham and Hillsboro counties in New Hampshire, which gives him the cities of Keene, Portsmouth and Nashua.

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Garage

Take Colorado Tire Agency — C. W. Raymor and I. E. Beaver have taken the agency at Marion, O., for the tires manufactured by the Colorado Tire & Leather Co.

N. Y. Tire Agency Moves—The salesroom of the Steel Pneumatic Tube and Tire Co., New York City, has been moved to the factory at 145 West Fifty-second street.

Kendall Takes Graphinoil—F. H. Kendall has taken the Southern New England agency for Graphinoil, with headquarters at 109 Washington street, Providence, R. I.

To Handle Accessories in Columbus—The G. M. Service & Specialty Co. is the name of a new concern located at 275 North Fourth street, Columbus, O., to handle accessories.

Highland Body's Louisville Branch—The Highland Body Mfg. Co., Cincinnati, O., has established a branch at 728 South Fourth street, Louisville, Ky., with A. J. and E. G. Schoen as managers.

Toledo Gabriel Snubber Agency Changed—J. C. Eppens has taken over the distributing agency in northwestern Ohio, with headquarters at Toledo for the Gabriel rebound snubbers formerly held by C. J. Clapp. The business will be continued at 1015 Jefferson avenue.

Motor Men in New Roles

Reynolds Joins Puritan Machine — T. E. Reynolds has joined the Puritan Machine Co., Detroit, Mich., in the capacity of manager of the accessory department.

Doyle Heads U. S. Tire Agency—The United States Tire Co. has opened a distributing agency at 1120 Lady street, Columbia, S. C. J. E. Doyle, formerly of Norfolk, Va., is the manager of the new agency.

Ericson Heads Louisville Empire—A. A. Ericson is manager of the Empire Auto Sales Co., agent for the Empire car in Louisville, Ky. This company recently established an office and salesroom at 437 South Second street.

Hobbs District Sales Mgr.—E. M. Hobbs has been appointed district sales manager of the Hoyt Electrical Instrument Works, with headquarters at 967½ Woodward avenue, Detroit, Mich. This company manufactures meters at Penacook, N. H.

Stephenson Retail Sales Mgr.—G. L. Stephenson, head of the one-time Stephenson Motor Truck Co. and Stephenson Motor Car Co., Milwaukee, has been engaged as retail sales manager for the Lauson-Salentine Co., 228-232 Wisconsin street, Milwaukee, Wisconsin distributor for the King.

Starr Heads Cal. Assn.—L. V. Starr, manager for the J. W. Leavitt Co., Los Angeles, Overland distributor for the Pacific coast, has been elected president of the Motor Car Dealers' Assn. The other officers and directors elected are: H. L. Arnold, P. A. Lord, Volney S. Beardsley and W. E. Bush.

Plummer Heads Insurance Dept.—E. S. Plummer has been appointed head of the automobile department of the American Central Insurance Co., St. Louis, Mo., and will make his headquarters at the home office of the company here. Mr. Plummer's territory will be that covered by the Western Union Insurance Bureau.

Gillette Joins Chase—C. N. Gillette, formerly employed at the Chase Motor Truck Co. plant, Syracuse, N. Y., but more recently manager of the Chase Agency in Charlotte, N. C., has joined the staff of division sales managers covering the states of North and South Carolina and Virginia, with headquarters at Charlotte, N. C.

West Makes Change — Albert West, who has been for some time connected with the Firestone Tire & Rubber Co., of which his brother Wylie West is Southern manager, is now connected with the Southern Tire & Rubber Co. at 225 Peachtree street, Atlanta, Ga., and will manage the agency for O. A. Moran, who is district manager.

Brown Dodge Supervisor — W. I. Brown, formerly with the sales department of the Studebaker Corp., Detroit, Mich., and later distributor for that concern in Indianapolis, Ind., has been appointed supervisor of districts for Dodge Bros. He will have direct charge of all the district representatives, the allotment of territory to dealers and the distribution of cars.

Albach Gibney Western Sales Mgr.—C. I. Albach, formerly of the St. Louis, Mo., branch of the Fireside Tire & Rubber Co., has been appointed Western sales manager of the Gibney Tire & Rubber Co., Conshohocken, Pa. He will make his headquarters with the Schelp-Budke Co., recently appointed agents for the Gibney tire in St. Louis. Albach covers eastern Missouri, southern Illinois, Arkansas, Kansas City and Indianapolis.

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Dealer

Discontinues Agency—The Auto Tire Co. at 129 Ellyn street, Hartford, Conn., has discontinued the Oakland agency.

N. Y. Cadillac's New Lease—The Detroit Cadillac Motor Car Co., New York City, has leased a store in the building at 3, 5 and 7 West Sixty-first street.

Buffalo King Moves—The Mutual Motor Car Co., distributer in western New York for the King, has moved into new quarters at 913-927 Main street, Buffalo.

Franklin Agency Moved—The Franklin agency in Oakland, Cal., the J. F. McClain Co., has moved to larger quarters on Broadway. W. F. Dandy is manager.

Newark Agency Moves — A. P. Hess, agent for the Ford, Hudson and Dodge in Newark, O., has moved into new quarters in the Pythian Temple Building on East Main street.

Detroit Chevrolet Moves—The Detroit, Mich., branch of the Chevrolet Motor Co., which heretofore was located at 815 Woodward avenue, has moved to 1246 on the same street, now occupying larger quarters, formerly the local branch of the Cartercar Co.

Milwaukee Garage Moves—The Lakeside Garage, Milwaukee, Wis., under the management of G. W. Boller, has moved to 370-374 Brady street.

Du Pont Fabrikoid Moves—The Du Pont Fabrikoid Co. has moved its New York City sales office to the Equitable Bldg., 120 Broadway.

Racine Tire in Seattle—Under the management of Edward Allen, the Racine Tire Sales Co. has opened in Seattle, Wash., at 1609 Eighth avenue.

Maucotel Buys Dallas Remy—E. A. Maucotel has purchased the Remy service station on Lane street, Dallas, Tex. He was formerly manager of the station.

Philadelphia Cole Moves—The L. S. Bowers Co., Philadelphia, Pa., distributor of the Cole car, has removed from 326 North Broad street to 245-247 Broad street.

Detroit Federal Rubber to Move—The Federal Rubber Co., now at 846 Woodward avenue, Detroit, Mich., will move the latter part of May to 247 Jefferson avenue, East.

Michelin Tire in Des Moines—The Michelin Tire Co. has opened a branch house in Des Moines, Ia. F. J. Potter is manager of the new concern. Headquarters are at 1109 Walnut street.

Davenport Co. Moves—The Positive Supply Co., Davenport, Ia., manufacturer of portable steam tire vulcanizers, has moved into the new three-story building, the Positive Bldg., 209 East Second street.

New Co. at Boston—The Magneto and Generator Exchange of New England is the name of a new company that has just taken quarters in the Motor Mart, Park square, Boston, Mass., with A. A. Gouldhart in charge.

Another Graphinoil Station—The Dunlap-Brown Co., Boston, Mass., distributor for Graphinoil, has signed a contract with F. H. Kendall to handle the product in southern New England, with headquarters in Providence.

Canada's New Tire Agencies—The Consolidated Motor Co., Vancouver, B. C., has opened a branch for Fisk tires at 1216 Granville street. McGavin & Ely have taken the representation of the Federal tire in Victoria, B. C.

Roskam-Scott to Move—The Roskam-Scott Co., New York City, has moved to larger quarters at 1896 Broadway. The company will continue to handle slightly used cars. A list of cars for sale will be issued monthly.

Republic's Newark Tire Agency.—The Republic Rubber Co. has made arrangements whereby Messrs. H. H. Wilcox and M. R. Clodio will handle its tire in Newark, N. J., under the name of the Republic Tire Agency, at 64 Halsey street.

Fafnir Bearing Opens in Detroit—The Fafnir Bearing Co., New Britain, Conn., has opened a branch office in Detroit, Mich., at 752 David Whitney Bldg. M. H. Cox, who represents the interests of the company through Ohio, Indiana and Michigan, will be in charge.

Has New Bldg.—The Boice-Perrine Co., one of the largest accessory houses in New England, has moved into a new building at the corner of Brookline avenue and Landsdowne street, Boston, Mass., where it has salesrooms and service departments under one roof.

Los Angeles Goodrich Moves—Manager Frank Carroll of the Goodrich Tire & Rubber Co., Los Angeles, Cal., has moved into his new quarters at 406 West Pico street. The service department is now in charge of R. J. Loomis. The total area of the Los Angeles Goodrich plant is 53,250 square feet.

Accessory Co. in Cumberland—The United Accessories Co. has been organized at Cumberland, Md., with J. H. G. Miller as president. Automobile and motorcycle accessories will be sold and special attention will be paid to garage equipments. The store is located at 20 North Centre street.

Fleetwood Opens Selling Branch—The Fleetwood Metal Body Co., Fleetwood, Pa., has opened a selling branch in connection with a designing department at 1789 Broadway, New York City. Ernst Schebera, for several years designer of the A. T. Demarest Co., New York City, has been put in charge of the New York branch.

Frisco Kelly-Springfield Agent—One of the most important changes in San Francisco (Cal.) tire circles is the announcement by District Manager W. H. Bell, of the Kelly-Springfield Tire Co., that the Weinstock-Nichols Co. will hereafter handle the Kelly-Springfield tires in both its San Francisco and Oakland stores.

New Home for Reo Agency—J. M. Linscott, who has the Reo line in Boston, Mass., has signed a long lease for a section of a new building under construction at the corner of Beacon street and Commonwealth avenue, that will be ready for occupancy by July 1, and he will move his salesrooms and service station there from his present quarters on Columbus avenue.

Safety Signal Co. in Detroit—The Safety Signal Sales Co., Detroit, Mich., has been organized by F. C. Braden, G. W. Russell and N. J. Janisse to sell a new safety signal device which consists of a miniature semaphore attached to the rear of the automobile. It is worked automatically from the brake pedal and carries colored lights at night. The offices of the company are at 404 Sun Bldg.

Hudson's New Philadelphia Home—Plans have been prepared and estimates invited for the construction of a large automobile warehouse and salesrooms at 253-255 North Broad street, Philadelphia, Pa. The proposed building, which will be eight stories high, will occupy at lot 48 by 120 feet and upon completion will be the home of the Gomery-Schwartz Motor Car Co., representative of the Hudson car. The site of the improvement is already occupied by the Gomery-Schwartz Co., but during the erection of the new building the company will have temporary headquarters at Broad and Cherry streets.

Lozier Places Service Stations—Arrangements have been made by the Lozier Motor Co., Detroit, Mich., to take over the service stations at New York City and Philadelphia, formerly conducted by Harry S. Houpt. The San Francisco (Cal.) service station has been placed in charge of G. A. and J. L. McPherson, of Detroit. The orders placed for New York City and Philadelphia amounted to 150 cars.

Large Garage for Milwaukee—One of the largest garages in Wisconsin to be devoted to used car sales exclusively is that being erected for the Wisconsin Auto Exchange at 115-117 Sycamore street, Milwaukee. The company is occupying temporary quarters at 173-175 West Water street, in the Plankinton block. The new garage will be 60 by 130 feet in size, one story high and nearly one-half of the floor space will be devoted to the machine shops for rebuilding and overhauling cars. Harry Kohn is general manager of the business.

To Rebuild Old Tires—The Oklahoma Tire Construction Co., Oklahoma City, Okla., has been organized with A. M. Loomis, of Chickasha, Okla., as president. Headquarters have been established there and work of reconstructing old tires into new has been started. State rights to the process have been obtained and machinery has been installed. The company proposes to take two casings of the same size and then by a process of sewing and cementing a double tread tire is produced at about one-fourth cost. The new tire is warranted 90 per cent. puncture and blowout proof with a double mileage.

Anthony's New Service Scheme—Earle C. Anthony, Inc., California distributor for the Packard, Chalmers and Grant cars, with headquarters in Los Angeles, has established a service scheme which is something new in its line. The system consists of coupon books entitling the buyers of new cars to stated amounts of service labor on their cars each month for a certain period of months, the amounts varying according to the price of the car. These coupons are good not only at the Los Angeles shops, but at every one of the 177 service stations established throughout that state by the company.

Automobile Agencies Recently Established

PASSENGER CARS

Arizona

Phoenix	Mitchell	Oscar Irvin
Phoenix	Stearns-Knight	Oscar Irvin

Arkansas

Little Rock	Oldsmobile	Thos. Cox & Sons
Paragould	Saxon	J. L. Thompson

California

Arroyo	Mitchell	C. E. Loomis
Arroyo	Stearns-Knight	C. E. Loomis
Bakersfield	Chalmers	Roscoe E. McCabe
Bakersfield	Grant	W. F. Goudy
Cambria	Mitchell	L. J. Renshaw
Cambria	Stearns-Knight	L. J. Renshaw
Clearwater	Apperson	C. C. Stahl
Colton	Apperson	Pioneer Garag
Compton	Apperson	H. A. Chaffee
El Monte	Apperson	J. M. Slaughter
Fresno	Oldsmobile	J. C. Phelan
Gardena	Apperson	Boulevard Garage
Gilroy	Oldsmobile	The Tice Garage
Lompoc	Mitchell	Bell & Canfield
Lompoc	Stearns-Knight	Bell & Canfield
Oceanside	Apperson	White & Bradley
Paso Robles	Mitchell	V. C. Melchoyr
Paso Robles	Stearns-Knight	V. C. Melchoyr
Puente	Apperson	E. F. Lowry
San Bernardino	Grant	Damon Cooley
San Diego	Auburn	Karl Martin
San Francisco	Chevrolet	Norman De Vaux
San Luis Obispo	Mitchell	E. R. Warden
San Luis Obispo	Stearns-Knight	E. R. Warden
Santa Margarita	Mitchell	J. W. Smith
Santa Margarita	Stearns-Knight	J. W. Smith
Van Nuys	Apperson	L. E. Van Patten

Colorado

Berthoud	Grant	Berthoud Garage
Canon City	Grant	Midland Trail Garage
Colorado Springs	Grant	H. N. Richmond & Sons
Eaton	Grant	C. W. Schultz
Ft. Collins	Studebaker	E. A. Sinnard
Ft. Morgan	Grant	A. C. Gillette
Monte Vista	Grant	Stephens & Corrington
Ordway	Studebaker	E. W. Cleverly
Pueblo	Grant	R. Birge
Rifle	Grant	W. F. Berry
Walsenburg	Grant	Adolph Unfug

Connecticut

New Haven	Chevrolet	Chevrolet Motor Co.
New Haven	Saxon	F. G. Atwood
Stamford	Saxon	Mechalay Auto Co., Inc.

District of Columbia

Washington	Saxon	D. S. Hendrick Co., Inc.

Florida

Pensacoln	Koehler	W. G. Porter

Georgia

Lyerly	Saxon	Doster & McKey

Idaho

Nampa	Chevrolet	L. C. McCain

Illinois

Johnston City	Chevrolet	Holland & Baker
Rock Island	Chevrolet	E. O. Noack
Springfield	Saxon	R. Haas Elec. & Mfg. Co.
Taylorville	Oldsmobile	C. Bradley & Co.
Walnut	Chevrolet	C. H. Ross & Co.

Indiana

Butler	Chevrolet	Lincoln Garage
Evansville	Saxon	Beverly Cycle Co.
Ft. Wayne	Chevrolet	W. H. Brown

Iowa

Bedford	King	R. W. Thompson & Co.
Burlington	Chevrolet	Farmers Motor & Supply Co.
Cherokee	Chevrolet	E. J. Lauer
Ft. Dodge	Chevrolet	Hanson & Tyler Auto Co.
Marshalltown	Oldsmobile	G. D. Brown & Son
Osage	Chevrolet	Ben Colton
Paton	Maxwell	L. V. Harpel

Kansas

Hutchinson	Reo	H. J. Haskard

Kentucky

Greenville	Maxwell	Eaves & Shutt
Louisville	Detroiter	Louisville Auto Exchange
Louisville	Maxwell	L. G. Baskett
Louisville	Maxwell	Motor Sales Co.
Louisville	Saxon	Motor Sales Co.
Midway	Maxwell	Cogar-Rumley Co.
Morganfield	Saxon	Young & Russell
Sadieville	Maxwell	E. S. Baldwin
Stanford	Maxwell	H. C. Carpenter
Turner's Sta	Maxwell	R. L. Pendleton & Sons

Massachusetts

Boston	Hupmobile	Hupp Motor Car Co.
Boston	Scripps-Booth	A. V. Shaw
Springfield	National	I. L. Dimm
pringfield	Saxon	Saxon Springfield Co.

Minnesota

Ada	Franklin	R. B. Hulick & Co.
Mankato	Chevrolet	Schwender Brothers

Maine

Auburn	Saxon	Saxon Motor Co.
Denmark	Saxon	C. E. & A. P. Cobb
Portland	Ford	Peterson Garage
Portland	Oldsmobile	Alexander & Worcester
Portland	Saxon	Portland Saxon Co.
Portland	Studebaker	A. Soule
Sullivan	Saxon	H. L. Cleaves & H. W. Dunbar

Michigan

Battle Creek	Chevrolet	Heyser-Finlay Motor Co.
Berrien Springs	Saxon	Edison Bros.
Clare	Chevrolet	J. T. Brown & Son
Cheboygan	Saxon	Vet S. Maloney
Dearborn	Saxon	J. Kott & J. S. Wright
Detroit	Chevrolet	L. J. Crane
Detroit	Chevrolet	Chevrolet Motor Co.
Flint	Chevrolet	Oscar Anderson
Flint	Chevrolet	Monroe Motor Co.
Flint	Chevrolet	Angus Paterson
Fremont	Briscoe	Jackson Garage
Gaylord	Saxon	Gaylord Auto & Repair Co.
Jackson	Chevrolet	C. B. Hayes
Marine City	Saxon	J. C. Bell
Muskegon	Chevrolet	Apple St. Auto Co.
Ortonville	Chevrolet	Scott Kendrick
Owosso	Chevrolet	J. M. Stewart
Pontiac	Chevrolet	Pontiac Auto Sales Co.
Port Huron	Cole	Port Huron Tire & Repair Co.
Port Huron	Chevrolet	Wm. Barkell
Washington	Chevrolet	Wright & Haughton

Mississippi

Greenville	Saxon	Chas. A. Ehlbert
Tupelo	Saxon	D. A. Harkey

Missouri

Farmington	Oldsmobile	J. R. Morgan
Jefferson City	Chevrolet	H. D. Brown
Lexington	Koehler	J. W. Cheatham
Marshall	Koehler	P. H. Rea Garage
Memphis	Koehler	W. C. Chew
Tarkio	Oakland	Hanna & Gelvin

Nebraska

Friend	Buick	Ray Page
Gothenburg	Oakland	C. O. Soules
Gresham	Oakland	Fuller & Tompkins
Hastings	Koehler	Stephen Schultz
Swanton	Buick	Fitl Brothers

New Jersey

Freehold	Saxon	Freehold Motor Co.
Perth Amboy	Saxon	Perth Amboy Garage Co.
Redbank	Saxon	F. H. Van Dorn Auto Co.
Sussex	Saxon	Sussex Garage

New York

Cape Vincent	Oldsmobile	E. C. Crooks
Carmel	Saxon	E. Fowler Auto Co.
Gouverneur	Oldsmobile	F. H. Farmer
Salamanca	Franklin	Charles R. Gibson
Syracuse	Saxon	Hugo Brugman

North Carolina

Windsor	Chevrolet	E. V. Gaskins

Ohio

Akron	Chevrolet	Chevrolet Motor Sale Co.
Akron	Chevrolet	Goodyear Tire & Rubber Co.
Alliance	Chalmers	I. L. Carson
Athens	Chevrolet	W. E. Moler
Canton	Chevrolet	W. A. Kennedy Hdwe. Co.
Chillicothe	Apperson	W. D. Mallow
Cincinnati	Grant	Eureka Auto Co.
Cincinnati	Hollier	Eureka Auto Co.
Columbus	Chevrolet	Winders Motor Sales Co.
Columbus	Jeffery	The Hilane Garage
Columbus	New Era	Daniels Motor Car Co.
Columbus	Pullman	Cott & McKelvey
Columbus	Stewart	Daniels Motor Car Co.
Delaware	Apperson	Howard Lennox
Jeromeville	Chevrolet	C. L. Ewing & Son
Kenton	Saxon	Ed Rose
Kirkersville	Apperson	H. S. Thompson
Milledgeville	Apperson	E. L. Fitchthorn
Mt. Gilead	Chevrolet	A. R. Tites
Newark	Oldsmobile	Clyde Bowmen
Springfield	Chevrolet	E. H. Hall
W. Mansfield	Chevrolet	R. H. Needham

Oklahoma

Jet	Regal	S. H. Thomas

Oregon

McMinnville	Oldsmobile	Jack Spence

Pennsylvania

Fayette City	Chevrolet	J. P. Sloterbeck
Rimersburg	Chevrolet	W. M. Armagost
Towanda	Saxon	G. W. Coolbaugh

Rhode Island

Providence	Maxwell	H. G. Duckworth
Providence	Oldsmobile	J. A. Welch

South Dakota

Alexandria	Oakland	Tabor Motor Co.
Centerville	Oakland	Nels Lind
Montrose	Maxwell	Wm. Peterson
Stratford	Saxon	Hutchinson & Hutchinson
Stratford	Metz	Hutchinson & Hutchinson

Tennessee

Auburn	Maxwell	J. D. Spears
Brandenburg	Maxwell	H. C. Woodson & Son
Caneyville	Maxwell	H. Willis & Son
Centreville	Maxwell	Levi Malugen
Dickson	Maxwell	Standard Motor Co.
Dixon	Maxwell	Poole Motor Co.
Franklin	Maxwell	Hardiman Auto Co.
Franklin	Maxwell	Franklin Auto Co.
Frankfort	Maxwell	Nichol Garage
Hartsville	Maxwell	C. A. Hammon
Jellico	Maxwell	H. M. Jones
Lawrenceburg	Maxwell	J. P. McWilliams
Middlesboro	Maxwell	H. E. Motch
Murfreesboro	Maxwell	McCullough Bros. Vul. Co.
Nashville	Maxwell	Chester Motor Car Co.
Portland	Maxwell	J. E. Kerley & Sons
Richmond	Maxwell	C. J. Turner
Savannah	Maxwell	Savannah Motor Co.
Sturgis	Maxwell	Stone Motor Co.
Vine Grove	Maxwell	A. F. Vertrees & Son
Waverly	Maxwell	Middel Tenn. Auto Co.
Wilmore	Maxwell	H. E. Fisher
Winchester	Maxwell	Highland Garage & S. Co.

Vermont

Burlington	Franklin	E. A. Brodie

Virginia

Chatham	Saxon	Southside Automobile Co.
Crowe	Saxon	MacTavish Motor Car Co.
Richmond	Oldsmobile	Commonwealth Motor Co.

West Virginia

Charleston	Saxon	E. R. Calloway
Clarksburg	Saxon	Monticello Auto & Garage Co.
Fayetteville	Chevrolet	J. C. Hamilton
Logan	Saxon	E. R. Mullins

Wisconsin

Brodhead	Herff-Brooks	Fleek & Knezel
Brodhead	Jackson	Fleek & Knezel
Broadhead	Overland	Fleek & Knezel
Clinton	King	E. Terwilliger & Son
Cobb	Sphinx	Gibbs Broth.
Delavan	Franklin	Stewart Garage
De Pere	Apperson	McGeehan Sons Co.
Fond du Lac	Chevrolet	J. D. Giddings
Horicon	Buick	G. T. Kalies
Janesville	Saxon	J. A. Strimple
Lone Rock	Patterson	Jordan & Webster
Manitowoc	Chevrolet	Olson & Pauley
Marshfield	Jeffery	Peter Daul
Menominee	Reo	Edmund Pieper
Milwaukee	Inter-State	Creek Motor Sales Co.
Morrisonville	Chevrolet	Elbert & Junge
Rhinelander	Case	T. C. Wood Hardware Co.
River Falls	Dodge	Elias Winner
Seymour	Jeffery	Otto Motor Co.
Sheboygan	Studebaker	H. & P. Schlichting
Sturgeon Bay	King	J. Peltier
Sturgeon Bay	Briscoe	LaMere Bros. Co.
West Bend	Stegeman	Kuester Bros.

Wyoming

Gillette	Grant	Arthur Harvey
Granby	Grant	A. P. Curtis
Grand Junction	Grant	Western Colo. Motor Sales Co.
Holyoke	Grant	P. Zimmerman
Idalia	Grant	G. T. Conrad
Kiowa	Grant	Russell Gates Mer. Co.
La Jara	Studebaker	F. C. Jones
Lamar	Studebaker	Lamar Hardware Co.
Laramie	Grant	Lovejoy Novelty Wks
Longmont	Grant	L. L. Swenson
Loveland	Grant	C. W. Coffman
Manzonola	Grant	Manzonola Auto Co.
Moorecroft	Grant	Charles Kirb
Newcastle	Grant	J. Sedgwick
Rawlins	Chevrolet	M. M. Rubner
Sheridan	Grant	W. C. Reid & Son
Wheatland	Grant	Wheatland Garage

COMMERCIAL VEHICLES

Indiana

Columbus	Koehler	The Williams Garage
Richmond	Koehler	Shirley & Gear.

Kansas

Coffeyville	Koehler	Coffeyville Garage

Massachusetts

Beverly	Koehler	J. W. Elliott

Michigan

Detroit	O. K	Moritz Mullen Co.
Jackson	Signal	Lewis Allen

Missouri

Joplin	Koehler	J. W. Gorsuch

Nebraska

Hastings	Koehler	Stephen Schultz

New Hampshire

Bethlehem	Koehler	F. D. Lewis & Co.

North Carolina

Statesville	Koehler	N. W. Fox

New York

Utica	Koehler	C. V. Kirkland
Westbury	Koehler	M. J. Knipfing

Pennsylvania

Warren	Koehler	C. A. Hubbard

Virginia

Lynchburg	Koehler	Bowles Auto Repair Co.

Wisconsin

Shullsburg	Kisselkar	G. M. Baker